THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CX. No. 2453.] LONDON, MAY 17, 1910. [62ND YEAR. PRICE 6d.

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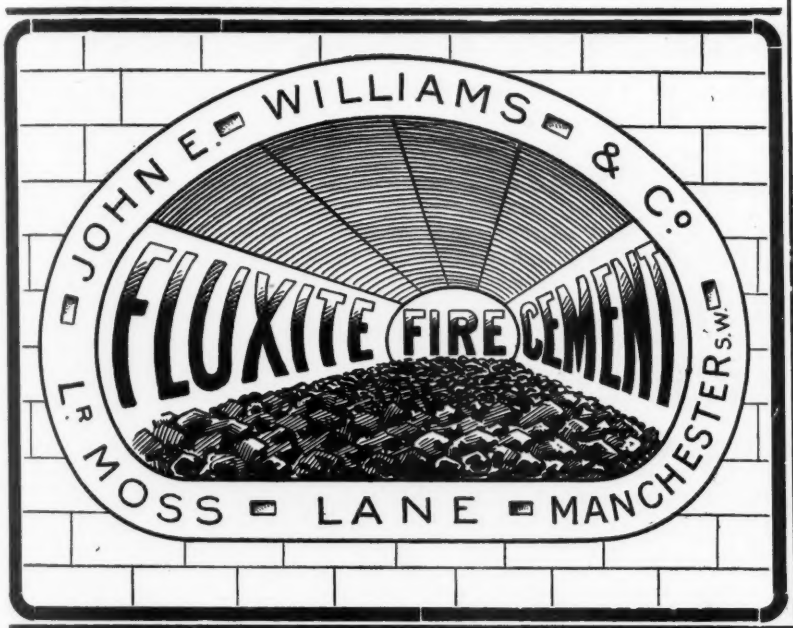

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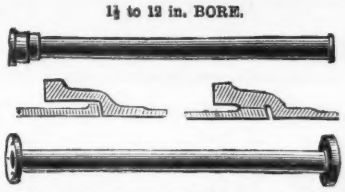

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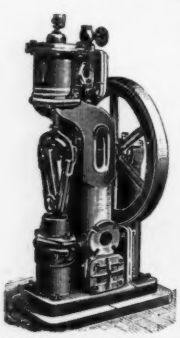

Fig. 705. "SINGLE RAM" STEAM-PUMP.

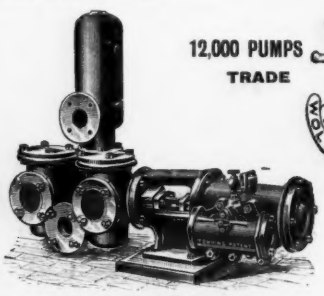

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

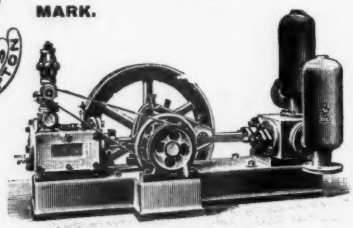

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "LOUBLE-RAM" STEAM-PUMP.

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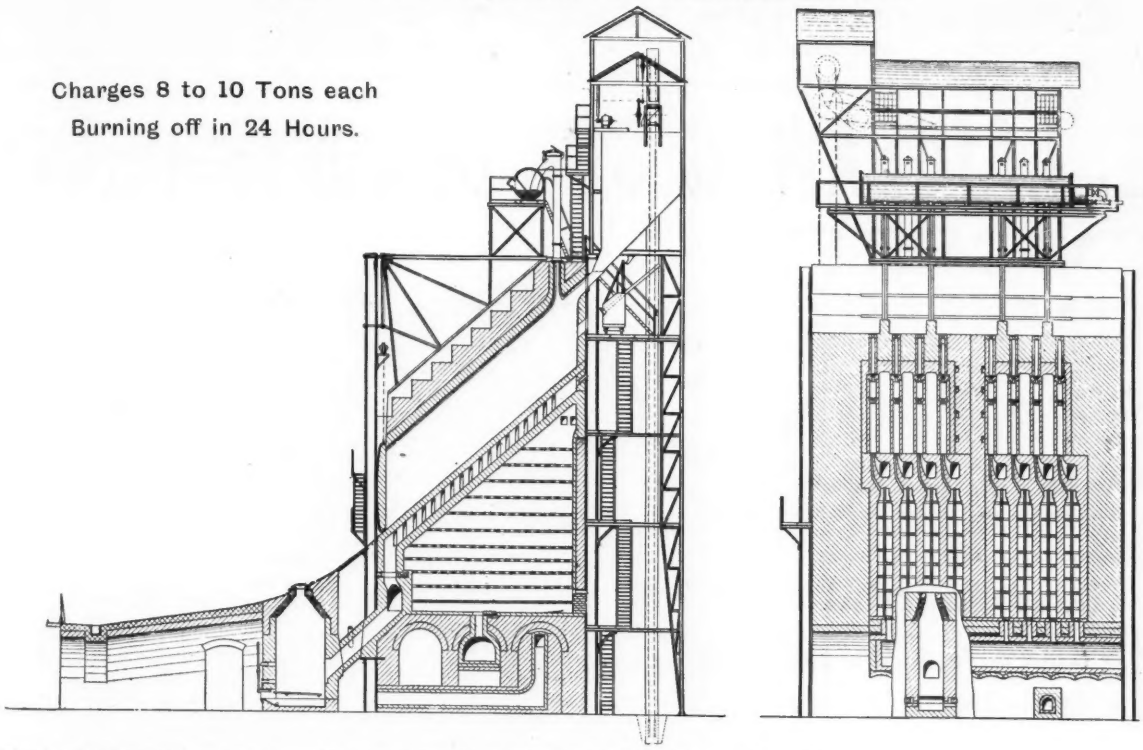

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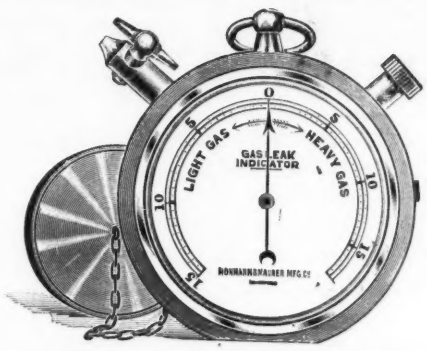

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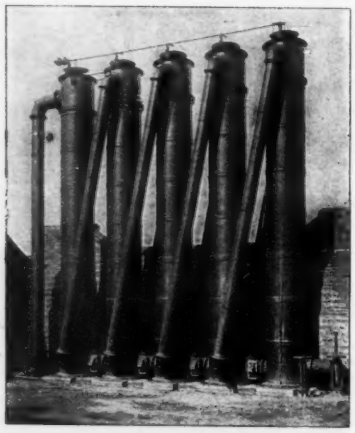

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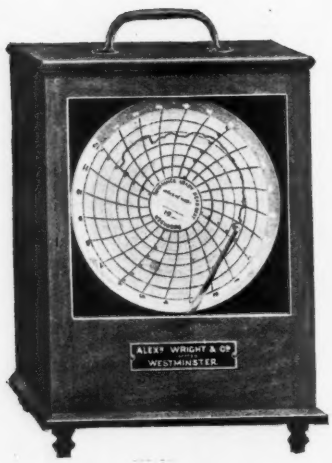

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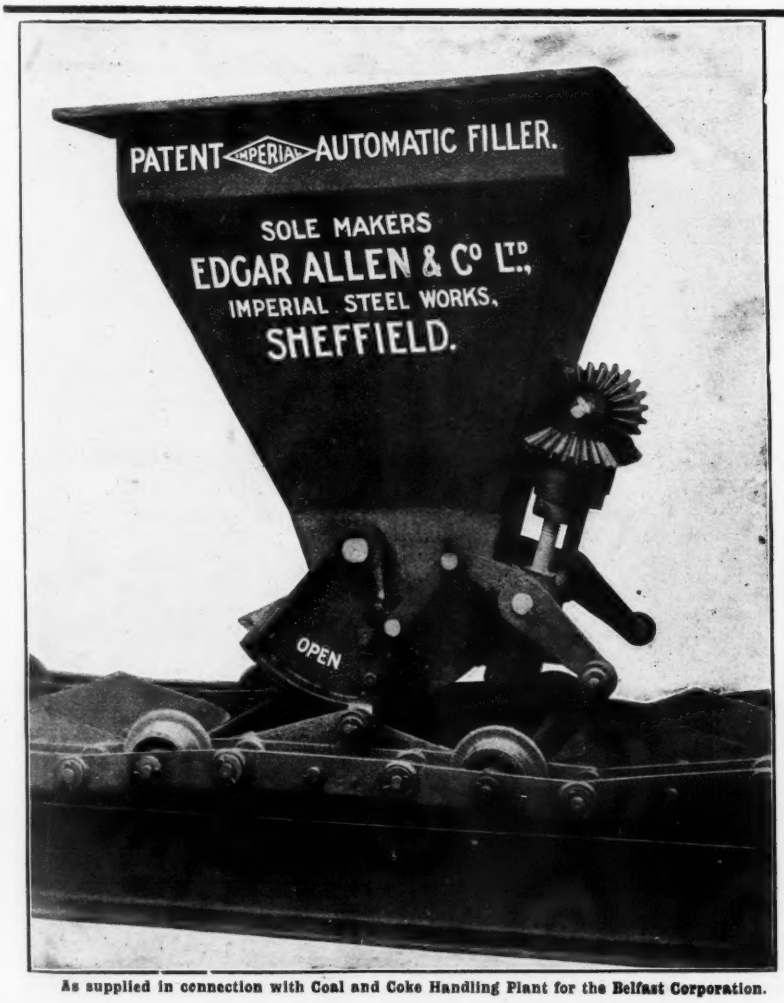

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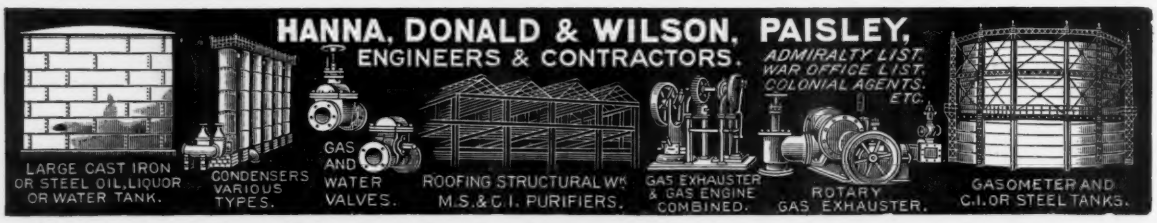
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EDITORIAL NOTES—GAS, &c.

Postponement of the Visit of our German Friends.

IT had been hoped that next week the gas profession of this country would have been giving cordial welcome to a large and representative body of their German colleagues. The death of King Edward, however, has caused the visit to be deferred; but it is only a long-anticipated pleasure postponed for a time. The suggestion for postponement was spontaneously made by our German friends; and every patriotic and loyal British gas engineer will appreciate greatly the delicate consideration, the sympathy, and the tribute to union in sorrow that the simply-worded message from Dr. Bunte conveys: "German colleagues mourn with "you the death of your great King Edward. We inquire "whether our visit at the advised time is convenient." As the programme arranged for our guests would have been, and will be when now arranged, partly of a festive character, postponement was, under the sorrowful circumstance of a nation's mourning, the best possible course. One of the touching things about the calamity that has befallen the nation is the testimony to the power that the late King universally held over the hearts of people, and to the respect for him that extends through all civilized countries. His personal qualities were magnetic. In the name of the British gas profession, the German Association are thanked here (as they have been by the President of the Institution of Gas Engineers, Mr. James W. Helps) for their profound regard for the late King, and for their sympathy while the nation is in the shadow of a great sorrow. Of this we feel confident, that when our German friends are on their deferred visit among us, the sincerity and heartiness of their welcome will not be any the less intense than it would have been, but for misfortune, a week hence.

Burner Maintenance—A Central Publicity Agency.

THE examination, in the article last week, of the question of incandescent gas-burner maintenance, viewed in relation to current competitive conditions, brought us to certain conclusions, which, of course, are subject to modification on further change in condition. It was concluded that it is necessary for gas suppliers to take in hand the supervision of consumers' burners—initially of consumers who are in a position to afford electric lighting, and among whom are in the main found the consumers who will not give the little periodical attention that is necessary to maintain the efficiency of incandescent gas-burners; that the labour incurred in supervision should be provided free of charge, in so far as it can be regarded as "free" when the charge is included in the supply of gas; that mantles and glassware should, seeing that electric light users have to provide their own lamps for renewal, be charged for; but that this renewal material should be priced out at cost, so as to serve as an inducement to consumers to allow the gas suppliers to undertake the work of maintenance, and to obviate the objectionable notion that has obtained currency in some districts that the gas suppliers make a profitable thing out of the sale of mantles and glassware, under the guise of "free" maintenance.

Having arrived at these conclusions, the financial side of the question has to be considered. The inquiry has been raised by a few gas men, Can we afford to do anything in this way for the consumers? And we have, on a previous occasion, submitted the inquiry in another and more emphatic shape, Can we afford not to do something? Many gas men have come to the conclusion that trifling with the question will not do; that the minimum effort is free supervision; and that the expense of it must be looked upon as the price of the insurance or protection of the business. Following this to its logical conclusion, it may be held that, whatever is done that is successful in retaining business, is to the advantage of existing consumers and capital interests. Retention of business means stability; its loss is an element of weakness. The weakest point in any business is that which requires the most careful guarding; and that point in our lighting business is the indifference of many consumers to the periodical attention that secures the maintenance of an economical illuminating efficiency. It is a question that must not be considered by gas purveyors in any narrow spirit. Evolution is continuous in the gas industry, as in other branches of the Arts and Sciences; and our own courses of action have to be shaped accordingly, and kept in parallel with all affecting development. The lesson is one to which we must pay heed. If expenditure is involved, it cannot be helped. There must be protection, and the cost of it must be faced. It is submitted that any revenue charge for this purpose is a deterrent to the lowering of the price of gas; and that it would be better to make a separate charge for burner supervision. We decline to admit the former as a fact in its ultimate effect. If a separate charge is made for supervision, few consumers will take advantage of the scheme; the injury arising from consumers' neglect will become chronic; and a larger proportion of the lighting business will go over to the competitor. The cost of "free" supervision would be comparatively small per 1000 cubic feet. By including it in the price of gas—incandescent gas lighting is so cheap—there will be no question on the part of the consumers; and the satisfaction engendered, inuring to the retention and extension of business, must in the end recoup the outlay. If peradventure it should not do so, then better the loss in the shape of expenditure than in custom. All gas consumers, more especially under company service, are materially interested in the continued progress of the gas undertaking; not in any set-back. And economical service for all classes of consumers—lighting, heating, and industrial—will be best promoted by a reasonable scheme of protection of any one part, as called for by changed circumstance. It is also submitted that, under the rule of the sliding-scale, any scheme of the kind that defers even a penny reduction in price infringes the rights of the shareholders. We cannot help feeling—however true it may be as applied to the time immediately before us—that this submission is a little short-sighted. The same argument applies to shareholders as to the consumers; protection of business means protection of dividend and price. It is a matter of policy that has to be regarded in perspective, as well as from the standpoint of proximate effect.

There is another direction in which protection is necessary; and that is in respect of the organized work of the electricity industry in general advertising and in the production of popularizing literature. It has for some time been a complaint in the organs of the electricity industry that, in its propaganda methods, it has followed in the wake of the gas industry. But in this particular, the gas industry has allowed the electrical industry to have precedence. This is the gas industry's own fault. In 1907, long before any co-operative movement was spoken of in the electricity industry, Mr. F. W. Goodenough, Chief Inspector of the Gaslight and Coke Company, strongly advocated, at the Dublin meeting of the Institution of Gas Engineers, a scheme of mutual publicity and defence. The idea, however, fell flat; and—mark this!—what was not then done by the gas industry has since been done by the electric industry. And the worst feature of it all is that we stand to-day without any effective means of taking counteracting measures, and of publicly combating misrepresentations. We must not be behind the electric industry in commercial strategy—that is to say, we must not be behind competitors in the good points of their commercial strategy, but we can afford to leave unimitated all kinds of disreputable misrepresentation.

This question of co-operative advertising and counteraction was also raised in the paper read by Mr. F. L. Wimhurst at the Eastern Counties Association meeting; and the

necessity of a real movement in this direction was subscribed to by more than one speaker—more especially by Mr. J. W. Auchterlonie and Mr. R. G. Shadbolt. The former stated that the Board of the Cambridge Gas Company would be prepared to become contributors to any such scheme; and the gratifying intelligence was announced by Mr. Shadbolt that the Commercial Sections had recognized the importance of some agency being established for the purposes in view, and that, as a result, by the time of the June conference in London, a concrete scheme might be in readiness for consideration. Whatever is done should then be done promptly, so that the campaign may be started before next lighting season—a campaign above reproach and suspicion, and free from the blemish of misrepresentation. But gas-works administrators must not expect that this work is going to be done for nothing, nor must they anticipate that any central publicity authority that may be formed will pay special attention to those gas undertakings, the managements of which refuse their support. The work of advancing and protecting interests is not a matter that should be subservient to parsimony; and what is done now must be done well to be effective. And to do the work well, it is essential there should be a large and encouraging financing of a central agency of the kind projected—a central agency that can do much more by joint support than individual undertakings can alone. This is not the time for being penny wise and pound foolish in this matter; nor for our gas administrators in their commercial ways to live in the past, and not in the present.

The Birmingham Appointment.

The announcement made in last week's issue as to the recommendation of the Gas Committee of the Birmingham Corporation that Mr. R. S. Hilton, Manager of the Clay Cross Coal and Iron Works, be appointed (at a salary of £1500, rising to £1600 at the end of twelve months) to the office of Secretary and Manager of the Department rendered vacant by the death of Mr. G. Hampton Barber, has settled much speculation and curiosity regarding the final choice from among those who were known to be near the goal. We heartily congratulate Mr. Hilton upon his success; and the Gas Department upon (subject to the approval of the City Council to-day) securing the services of one who, independent of the gas industry, has yet secured large experience of the markets in which the Committee have their most important dealings. But while we congratulate Mr. Hilton, it must be said that it cuts against the grain in the official ranks of the gas industry to see this particular appointment going outside. However, the reasons that have influenced the selection of a man for the office not technically trained in the gas industry, are more local than otherwise. There were circumstances existing that persuaded several, with considerable experience in the industry both technical and commercial, who might possibly have sought the position, from refraining to do so; and there was at least one actual withdrawal of candidature on the same grounds.

The whole position is governed by what was done some two years or so ago at the time of Mr. Henry Hack's retirement from the Chief Engineership, when each Works Superintendent was placed in full charge and responsibility of his station (without a technical head over the whole). The policy of divided responsibility without a technical chief is not one for general acceptance and application; and we are not going to turn our backs now on the views expressed, when the change was made at Birmingham, as to the general inexpediency of the policy. But we do most willingly and freely acknowledge that the technical results at Birmingham during the past two years show completely that the Station Engineers have worked—and that successfully—to prove themselves entirely worthy the confidence placed in them. That was where the Gas Committee, in making the new appointment, found themselves (as it were) on the horns of a dilemma. There were men with technical training well suited for the vacant position; but the Works Engineers claimed, and with reason, that the new policy had worked well, and what more natural than that they should desire to remain wholly unfettered by any technical domination from the occupant of the office at the Town Hall. As they stand at the present time, they have liberty in their work, and opportunities for proving their own abilities; and they do not care now to give up their independence as Station Engineers and Managers, and be content to work in the shadow that might be cast over them by a Secretary and Manager with full technical competence. Whatever one's opinions may be on the general question of policy, one cannot help feeling a great deal of sympathy with the views on this particular matter of the Birmingham Station Engineers. They had much at stake; and we congratulate them on what is believed to be, from their point of view, a happy issue out of a matter that must have been disquieting to them while it hung in the balance. They may be trusted to continue to do their utmost to justify the reliance reposed in them by the Gas Committee and the City Council.

A Need in South Wales and Elsewhere.

We cannot appraise too highly the practical move that the Welsh Association made at their meeting on Wednesday last, at Cardiff, in instructing the Council to appoint a Sub-Committee to seek the best means of providing facilities for the technical education, as distinguished from practical work, for the young men of the industry in their area who aspire to a full measure of competence in the altered circumstances of our times. The subject was introduced in a thoughtful paper, not overweighted with the trite argument which is generally accepted as true if not universally carried into practice, by Mr. H. D. Madden, the Engineer of the Cardiff Gas Company. He titled his paper "The Need of "the Gas Industry in South Wales;" and the need of the territory covered by the Association is also that of many other extensive districts not blessed with readily accessible large centres boasting properly equipped scholastic establishments for imparting special knowledge on the higher planes that may be, and indeed must be, applied to the practical ends of our industrial work. The young men of the gas industry in a district like South Wales labour under peculiar disadvantages in the matter of obtaining requisite scientific education. For the greater part, the undertakings are not large; and the works give occupation to (except the distribution department) but one or two young fellows who endeavour to qualify themselves, under the adverse circumstance of restricted opportunity, for the more responsible posts. To them distance, railway fares, and time are barriers to obtaining all the benefits that would be theirs if they, by their collective numbers, could justify the extension of the curriculum of the centres of technical learning so as to embrace them. Technical colleges naturally lay down their educational plans on lines that will attract the greatest number of students; and the industries that are most prolific in their yield of students are those that get their special requirements in the matter of instruction catered for. A district like South Wales can really offer, under present circumstances, little inducement to the technical colleges in Cardiff and Swansea to make special provision for the students of the gas industry. A technical college wants some encouragement, and some guarantee as to a fair permanence, before it can be expected to launch out into new work in this way. There is the point that requires very earnest consideration and attack; and the point is governed by the, under their existing conditions, disabilities of the would-be students.

The Committee will find they have a big task before them; but it is a task that, from the very difficulties with which it is surrounded, should impel to very serious effort. It seems to us the first information to be collected by the Committee refers to the facilities that the technical schools of the area can offer; and the conditions on which they would be prepared to enter upon the new branch of work. Having ascertained this, the next thing to be done is of an even more serious character; and that is to remove the obstacles that lie in the paths of those who desire to be the students. These obstacles can only be cleared away by those in administrative capacity; and it is the governing body of every gas undertaking who have to be convinced by their technical officials (who are already themselves convinced) as to the need of rendering assistance in the attainment of desirable qualifications by the young men on whom executive burdens will devolve. The basis of the gas industry's work has broadened and deepened; but we have not traced any general broadening or deepening of receptive power on the part of our gas administrators that has enabled them to embrace the fact that upon them rests responsibility in rendering aid to produce the utmost efficiency in the ranks of those who have to deal, or will have to deal, with circumstances that have developed, and continue to develop, out of all character with the conditions

of the past. We have used the word "general," because we are pleased to say there are many and prominent exceptions. But beyond them custom seems adamant in the administrative ranks; and what was good enough in a bygone time seems to them good enough now. That is a hardened belief that will require much to shatter it. And to make a success of their work, the Sub-Committee will find that this is one of the primary matters that will have to be seriously tackled. What they have to do is not to look at the question generally from the point of view of the most favoured conditions of the best situated gas undertakings in the area, with probably the most open-minded and progressive boards of directors, but from the other extreme. We wish them well in their work, and can promise them that any assistance we can give, through our columns, shall be rendered willingly and freely in this, in our judgment, most important cause.

Refractory Material Destruction.

When Mr. F. J. Bywater read his paper on "Refractory "Materials" before the Institution of Gas Engineers in 1908, he did—no matter whether or not all professionally engaged in gas manufacture agreed with him *in toto*—an exceptionally good service to the gas industry. Since then more attention has been accorded the question than ever before. Those manufacturers who had not done so previously have realized (though they may have been slow to act upon the knowledge) that conditions have changed under which their goods are used, and that a policy of *laissez faire* on their part will not promote commercial security. Gas engineers, too, have recognized more deeply the importance of the matter to them, in view of the heavy expenditure entailed in retort-settings and their upkeep. It passes strange that on the surface there seems little willingness on the part of some of the manufacturers to publicly admit a mutuality of interest, and to give the evidence of a desire to comply, in every respect, with the demands of changed circumstance. A short series of articles is being contributed to our pages by Dr. Alfred B. Searle, on "The Causes of the Destruction of "Refractory Blocks and Retorts;" and our contributor is just as piquant as Mr. Bywater was two years ago in his denunciation of manufacturing firms who have failed to grasp, or who have ignored, the significance on their own work of the more stringent temperatures, and the greater physical endurance required, under the conditions of use of their own productions. Such changes in use are not met, in this case, by a sort of idolatrous adherence to the mixtures and methods of half-a-century ago. Mr. Searle does not put upon his indictment a universal appositeness; but he releases few from his accusation of a propensity to continue to dwell in the dark ways of incomplete knowledge regarding the best means of making productions suitable to contemporary purpose. This is seen in the pregnant lines: "In no branch of clay working is progress more needed "than in the manufacture of retorts and blocks for the "making of gas; and while there are a few manufacturers "who are studying the subject in a thoroughly systematic "and scientific manner, and who are willing to pay well "for helpful advice and suggestion in this direction, the "majority of manufacturers are trying to puzzle out a way "for themselves—never noticing that they have not the "necessary appliances, nor the needed training for carrying "out highly technical and very delicate research work."

But Mr. Searle does not come forward with the view of merely whipping, by animadversion, the manufacturers of fire-clay goods into a more studious and scientific frame of mind (so that their fortunes may not be dependent alone on chance) in connection with the production of their goods. He offers them various suggestions, both explanatory and useful. There is no question as to the difficulties that besiege the manufacturers; but the critics are all agreed that insufficient work has been done to subjugate them. The difficulties and the problems are manifold; but that is not to say that they are altogether beyond the composing power of human effort, aided by Science. We know that they are not. It is equally a matter of knowledge that it is a case of every manufacturer for himself. Old methods and old convictions have to be thrown to the winds; and involved questions have to be faced. The chemical constituents of fire-clay have to be found and frequently checked; likewise their quality has to be determined with recurrent checkings; and proper mixtures have to be decided for the production of goods for specific purposes, requiring dissimilar degrees of refractoriness. There has to be discarded the notion that refractoriness has some direct relationship with the percentage of silica a clay contains. There is warning against such unwarranted assumption in both the article by Mr. Searle and in the paper read by Mr. Bywater. There are many other considerations—for instance, the varying percentages of impurities in the clays—such as the authors put their fingers upon in their respective writings. The tests for heat resistance are treated of by Mr. Searle; but, from the standpoint of the user of fire-clay products, such tests are only of value within limits. Actual conditions of use, for example, in a retort-setting are much more drastic in character than the conditions obtaining in the mere submission of a piece of clay fashioned as a Seger cone to a more or less high temperature. This is recognized by Mr. Searle, when he says: "Many clays may pass the test for refractoriness, "and yet may fail when made up and used. This is not "due to faults in the test; but to the much more trying "conditions of actual employment." What is required is some assurance that a retort, a fire brick or block, and such-like will (as our contributor puts it) withstand the action of a high temperature under the latter circumstances, which are often widely different from those under which the material is tested for its refractory value.

The Profits of a Promotion.

The promotion of the Kent County Gas Company comes to light again. The effects of these fraudulent promotions persist long in existence. The return to notice of the Kent County Company, however, has had a good result, in that a pronouncement has been obtained from Mr. Justice Phillimore regarding the profits made by the promoters; and his decision would apply to many other promotions of gas and water companies of recent years, which have, one by one, been added, or are becoming ready for adding, to the heap of wreckage. The question for the decision of the Court was as to whether there had been a breach of trust on the part of the man Darby, as a promoter of the Company, which rendered him liable for damages to the amount of the profit that he received on the promotion, less the promoting expenses, and the amount paid on account of the guaranteed dividend. The settlement of the question of liability rested on the point as to whether or not there should have been disclosure of the amount of profit made. The purchase of the Goudhurst works, which represented the lock, stock, and barrel of the Kent County Company, was effected by the promoters for £2350; and they sold the concern within a few months for £21,800. Mr. Justice Phillimore's view and decision are neatly concentrated in the one sentence, "If ever there was a case in which undisclosed profit ought to have been disclosed, this was one." The claim was therefore made out; and this will not add to the comfort of certain other promoting cliques of which the gas industry has had more than its full share.

Gas Profits at Burton-on-Trent.

It was indeed an excellent report that Alderman Lowe, the Chairman of the Burton Corporation Gas Committee, had to lay before the Town Council last week. The past twelve months have established a record in profit making; the surplus being £12,393, or £3660 in excess of that for the preceding year. Of this, £7000 is to be handed over in relief of the rates—a really magnificent sum, representing, as the Chairman stated that it does, a charge of no less than 5d. per 1000 cubic feet on the gas consumers. The man who does not use gas at Burton, may well thank the one who does for thus shouldering a portion of the burden which should in strict justice be borne by the non-consumer. However, this drain on the undertaking is likely to be less objected to in Burton than in some other places—though, of course, the question of the soundness or otherwise of the principle is not thereby affected—as the Chairman was able to hold out strong hopes (while declining to make any definite promise) of an early concession in regard to the charge for gas. The policy of supplying stoves free to prepayment consumers is stated to have been so successful that no turning back is likely in this direction. In fact, the popularity of the prepayment meter here, as elsewhere, continues to strikingly manifest itself. Another point on which the Chairman touched with evident gratification was with reference to experiments lately made with gas-works coke and breeze by one of the local brewery

companies. Its use in this connection, for boilers and coppers, has proved to the company in question that it is as efficient and as cheap as other fuel; and a contract for a supply during the current year has now been entered into by them. As Alderman Lowe emphasized, this is a matter of importance; for such contracts are of advantage to the brewers and to the town as a whole by doing away with the smoke nuisance, and to the gas undertaking as affording another outlet for their coke. Both the ratepayers and those responsible for the management are to be heartily congratulated upon the position of the Burton Corporation Gas-Works. Indeed, one member clearly showed the satisfactory aspect of affairs financially, by the remark that, taking into consideration the redemption fund and the reserve fund, the undertaking was at present virtually out of debt, though there were loans which would not expire for some three years.

Proportional Representation in Boroughs.

A Bill has lately been introduced by Mr. Aneurin Williams, who is supported by Lord Hugh Cecil, Sir Alfred Cripps, Sir Henry Kimber, Sir Mark Stewart, and other members, to authorize the introduction of proportional representation in municipal elections. At present each ward of a municipal borough, or the whole borough if not divided into wards, elects several councillors. In London, as a result of orders made by the Local Government Board, the elections are triennial, and affect the whole of the Council; but in provincial boroughs one-third of the Council are elected every year. In all cases a voter can give as many votes as there are vacancies, but not more than one vote to any one candidate. A bare majority of electors can thus secure all the vacant seats. It is proposed to allow municipal bodies, by a resolution of a three-fifths majority, to alter this system so as to allow each voter to give one vote only, and thus enable any considerable fraction of the electorate to return one member. In provincial boroughs adopting the Act, the Metropolitan system of triennial elections would be substituted for the present plan. The alteration would in the first instance take effect for three years only, but could be continued in force by two successive resolutions at intervals of three years. The last resolution would be laid on the table of both Houses of Parliament, and it could be annulled by an address of either House. On the system of voting proposed, the number of votes necessary to secure the return of one member is approximately the result of a division of all the votes cast by the number of vacancies, and is called the "quota." In order to prevent waste of votes, provision is made for the transfer of votes in excess of the quota given to any one candidate, and of votes given to candidates whose supporters are less in number than the quota. Such votes are transferred to the candidates whom the voters indicate on their ballot papers as next in order of their preference.

The Société Technique and the Late King.

The President of the Institution of Gas Engineers (Mr. J. W. Helps) received last Saturday morning from the President of the Société Technique du Gaz en France (M. Godinet) a letter expressing the regret of the Society at the severe loss which has plunged this nation into mourning. The President recalls the circumstance that the name of Edward the Seventh was acclaimed by the members of the Society as cordially as by their English colleagues on the occasion of their memorable reception two years ago; and he then proceeds: "To-day we assure you of our profound sympathy; and we bow respectfully before the tomb of a great Sovereign—a loyal Peacemaker—who leaves in France ineffaceable memories." Mr. Helps at once replied to this sympathetic letter.

Robert Dempster and Sons' Conveying Plant.

The gradual replacement of manual labour by mechanical appliances for the conveyance of material in gas-works renders it necessary for every gas manager to make himself familiar with the various kinds of plant in use for this purpose. To assist him in so doing, Messrs. Robert Dempster and Sons, Limited, of Elland, have issued a new catalogue dealing specially with the branch of their business connected with the elevation and conveyance of materials. As the catalogue is a bound volume of more than 400 large pages, most of which contain illustrations, its production must not only have entailed much thought, but considerable expense. There are 24 sections, the first nine of which are devoted to plant for the conveyance of material; the remaining sections dealing with aërial ropeways, hoists, waggons, power-transmitting appliances, &c.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 456.)

The tone and tendency of the Stock Markets last week were quite favourable. In the state of general unpreparedness of the whole community for the saddening intelligence of the previous Friday, prices all round had been freely lowered as a measure of caution; for it was felt that time was needed for reflection and the recovery of calm. That this state had been attained was at once evident on the re-opening of the Exchange on Monday. Without abatement of mourning for him who had gone, there was a universal feeling of confidence in the new *régime*. Thus encouraged, the markets became firm and cheerful; and prices were put up again to the level from which they had been displaced, and higher in some cases. Government issues were strong. Consols rose $\frac{5}{8}$. Railways were full of rise, though they overran the mark a little before the close. The Foreign was good, and almost everything was better, except drapery and other undertakings most affected by the arrest of the London season. The tide was still rising on Tuesday, aided by the promising aspect of the fortnightly settlement. Consols were $\frac{1}{4}$ higher, and Railways had got over their little check of the day before. But in the fashionable speculation there was irregularity. On Wednesday, several minor factors co-operated to promote the cheerful feeling. The chief departments were very firm. On Thursday, further advances were made in many markets, though the last prices were not quite the best of the day. Consols lost $\frac{1}{8}$, owing to a tightening of discount rates. On Friday, business dwindled to light proportions, in view of closing for Whitsuntide. Consols were firmer; but there was no great movement anywhere. In the Money Market, for the first half of the week, the supply was abundant, and terms for short loans and discount eased away materially. But on Thursday a change supervened. Business in the Gas Market was only moderate; but the tone generally was firm, and there was but little change. In Gaslight and Coke issues, the ordinary was very steady—all transactions being within the limits of $103\frac{1}{2}$ and $104\frac{1}{4}$. In the secured issues, the maximum made $89\frac{1}{8}$, the preference $104\frac{5}{8}$ and $104\frac{3}{4}$, and the debenture from $82\frac{3}{4}$ to $82\frac{7}{8}$. South Metropolitan was firm at $120\frac{1}{2}$ to $121\frac{1}{4}$. In Commercial, the $3\frac{1}{2}$ per cent. was done at $104\frac{1}{4}$ and $104\frac{3}{4}$. Among the Suburban and Provincial group, Alliance and Dublin fetched 83 and $83\frac{1}{4}$, Brentford new $189\frac{1}{2}$, South Suburban 121, and Wandsworth 140. In the Continental companies, Imperial was done at from $181\frac{1}{4}$ to $182\frac{1}{2}$ *cum div.*, and at 178 and $178\frac{1}{2}$ *ex div.* The debenture realized from from $94\frac{1}{2}$ to $95\frac{1}{4}$. Union was done at 99, European fully-paid at $24\frac{5}{8}$, and Malta at $5\frac{1}{4}$ special. Among the undertakings of the remoter world, Bombay new changed hands at $5\frac{1}{4}$, Primitiva at from $7\frac{3}{8}$ to $7\frac{1}{2}$, ditto preference at from $5\frac{1}{4}$ to $5\frac{1}{2}$, ditto debenture at 99, San Paulo at $15\frac{3}{8}$, and ditto preference at $11\frac{7}{8}$ and $12\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Penalty or Preventative—Local Government Board Requirements—More Organization—Gross Profits and Gross Management—The Tables Turned—Electric Lamp Ratings.

One of the things that have made our friends of the electrical industry stand agape over the Westminster lighting contract, is the temerity of the Gaslight and Coke Company (though they did, and naturally, try to get an abatement from 5s. to 6d. per lamp per night) in taking the contract with the first-named penalty attaching to it. The fact shows the confidence of the Company; but the electricians are shouting at them from all quarters, "You cannot do it." There is a remark in the "Electrician" with which, however, we are in total agreement; and it is that the 5s. per lamp per day, when applied to the lower candle powers contracted for, is an exorbitant charge, and the punishment is immensely disproportionate to the crime. It almost looks vindictive. There has been much written of late years as to fair conditions of contract as between all parties. Sir Alexander Kennedy was talking of it in his address when President of the Institution of Civil Engineers. The Institution of Gas Engineers and the Society of British Gas Industries have also been working with practical success at the question. Withal we have here what seems a severe punishment; but perhaps the Westminster City Council would say the fine must be regarded in the light of a preventative, as well as a penalty for misdemeanour.

It would be a very useful thing if some one would prepare a *vade mecum* relating to Local Government Board inquiries in respect of applications for loans for electric light undertakings. For it is a singular thing that with all the publicity that is given in the ordinary news channels from time to time, as to the requirements of the Local Government Board at such inquiries, many corporation officials, and particularly those of the electricity departments, do not appear to realize what is needed. There was an inquiry at Cheltenham just lately into an application for a loan amounting to £4000 for electricity purposes; and it transpired that there was an unexpended balance of £18,078 on loans previously sanctioned. No one could give Mr. H. Ross Hooper any information as to how this balance was arrived at; and consequently the Inspector expressed himself dissatisfied with the past method of keeping the accounts. It ought by this time to be

known far and wide that the Local Government Board require that capital accounts should be so kept that every sum sanctioned and allocated to a definite purpose shall have its history fully recorded in the books of the undertaking, and not form part of a pool from which the money is drawn at random for all sorts of purposes. The only way the Inspector could see out of the difficulty was by cancelling the balances of sanctions, and starting with a clean slate as from April 1 this year.

Another point upon which the Local Government Board have very properly formed an inflexible rule is in respect of only granting loans for new plant when the local authority have fully decided what work is to be done, and what it will cost. But at an inquiry into an application by the Southampton Corporation for a loan amounting to £16,000 for electric supply purposes, the Borough Electrical Engineer was unable to give anything but general information regarding the purposes for which the money was to be spent; and so the inquiry had to be adjourned *sine die* for the production of more positive information. At both the Southampton and Cheltenham inquiries, the old question of paying for meters out of revenue rather than capital, in accordance with the views of the Local Government Board, was brought up; and the Corporations were asked by Mr. Hooper to make this the practice in future, inasmuch as "electrical devices very quickly get out of date, and the system of charging meters to capital was not sound finance." In the case of Cheltenham, the Corporation had earmarked £1000 for meters; and this was reduced to £500 —the other £500 being added to the amount needed for services. Another thing municipal electricity committees are fond of doing is to expend money before obtaining sanction to the loan. The Local Government Board are also looking after this matter with a little more severity; and a warning has passed between Whitehall and Bridlington to the effect that, if the Council proceed with extensions that are the subject of a loan application, and the Board decline a loan, the expenditure will have to be a charge on revenue. The Council are bold, and assert that they are going to run the risk. Reverting to the Southampton inquiry, the public lighting controversy was mentioned. There were ratepayers present to oppose the loan if any part of it was to be expended on public lighting; but the trouble was bye-passed by a declaration being made that no part should be so expended. However, though the Local Government Board decree this and that, there are times when there is non-compliance with their decisions, and local authorities ride roughshod over them.

The electrical industry is interesting in more ways than one. From the first it has suffered from overdoing everything with which it has association. In the beginning of its history, capital expenditure was on a gorgeous scale; on its manufacturing side, firms and works sprung up with remarkable vigour, and now they are engaged in that exciting if unprofitable occupation of squeezing the life out of each other. The industry gave birth to quite a number of electrical papers, which —— never mind, they are with us, and assist to make life pleasant. Then there is not a single branch of the industry that cannot boast of its own special organization. The engineers have an Institution; the municipal undertakings an Association; the manufacturers have their organization; and so have the electrical contractors. And yet the industry is not happy. Now a Committee has been formed, the primary object of which is to endeavour to secure united action with a view to the protection and advancement of the commercial and legislative concerns of the British electrical interests. We should have thought with the number of organizations in the electrical industry that another was not required for any purpose. It is singular that many of the present troubles of the industry have been brought about by excessive development of provision in all directions, and that it should be considered that this further development is required to help to right the errors of the past. The Committee, it is mentioned, in its collective capacity, stand under the banner of neutrality on all contentious matters. May they continue as they start.

There are inquisitive councillors at Hastings, and there are councillors who see a humorous side to a most serious state of things. A number of questions that were put to the Borough Accountant regarding the finances of the notorious Electricity Department were answered at a recent meeting of the Council. The inquiries referred to the amount of the gross profit and its disbursement since the electricity undertaking, unfortunately for the ratepayers, was taken under the wing of the Council; and, among other points, information was asked as to the dividend that the gross profit would have allowed had the concern been in the hands of a company, without coming upon the ratepayers for a pennypiece. At the best, the dividends would have been shockingly emaciated and irregular ones; and last year there would not have been a fraction for the shareholders. This last announcement is reported to have caused laughter. What there is that is funny in a concern being so unproductive that nothing is available in the shape of the wherewithal to pay a dividend, we cannot see. But if the reporter was telling the truth, there are town councillors at Hastings who find what to most people would be a source of deep regret a source of humour. But we do not see what benefit it is to the ratepayers to know that the gross profit (a large part of which has been provided by the ratepayers through expensive public lighting), since the purchase of the concern to March, 1909, has amounted to £81,187. Of greater importance to them is the fact that those who patronize the undertaking did not provide sufficient profit by £11,043, up to March, 1909, to meet the undertaking's liabilities; and that it is estimated that last year will require a deficiency of £2000 to be made up. These sums the ratepayers have had to find, in addition to the heavy expense of public lighting by electricity. If there was a little less torpor among the general body of ratepayers, they would unitedly rise in revolt against this condition of things, instead of being cajoled by soft words, promises, and predictions from time to time as they are now. Wondrous things have been going to happen according to the mouthpieces of the Electricity Department; but as the succeeding financial statements have come along, promises have been found to be nothing but Dead Sea fruit. How the ratepayers must wish that some company had derived the lean dividends spoken of, rather than that they (the ratepayers) had had to meet from their own pockets the big deficiencies of municipal speculation and maladministration. At the same meeting at which these financial matters were up for discussion, the Council light-heartedly consented to a further extension of the electric cables without any guarantee of an adequate return from it; and contrary to the opinion of the Local Government Board, they passed a resolution for the conversion to electricity of a further 249 lamps. Here, again, the expenditure for this conversion is landed upon the ratepayers—not for their benefit, for the efficiency of the electric lamps is less than that of the gas-lamps, but solely to give the generating-station the dubious glory of turning out a greater number of units. The result of such foolishness is the frequent drain upon the ratepayers' pockets. How much longer are they going to meekly occupy the position of the unfortunate toad under the harrow? We shall see. While, however, the Corporation are making the ratepayers suffer in this way, they are also minded that the Gas Company shall (in addition to what they have to bear as large ratepayers), if the Council can get their way, have the heaviest possible load dragging at their heels. The Council have determined to again oppose the Standard Burner Bill; and it has rarely been our lot to read so ridiculous a medley of charges and requests as appear in their petition lodged against the measure. The House of Commons Committee will no doubt apply a little commonsense in adjudicating upon the position as affecting Hastings; and they may ask themselves whether the authors of this petition, in which is traced the simulation of righteous indignation, have any identity with the maladministrators of the Hastings electricity undertaking.

The tables are turned at St. Anne's-on-Sea. Since the electricity concern started nine years ago, the sum of £3500, which is grandiloquently spoken of as a "handsome return," has been transferred from the profits in relief of the rates. But Mr. Councillor Hodgkinson sees an injustice in this; and so do we. There are fewer electricity consumers than gas consumers, which is not surprising, though Mr. Hodgkinson asserts (and we just as positively deny it) that electricity in the town is as cheap as gas for lighting purposes. But it is the former fact with which we are concerned at the moment; and, being a fact, it lends emphasis to the declaration of the Councillor that "it is obviously unfair that electricity users should pay an unreasonable price in order to supply funds to relieve gas users." With a transposition of "electricity" and "gas," there is in the simplest and plainest of phrases, the contention at which we have been hammering long before electricity took the field against gas. But circumstances alter cases. Now if there were only a majority of Mr. Hodgkinsons on, for example, the Birmingham, the Manchester, and the Salford Councils, how happy the gas consumers would be, and how unhappy would be the managements of the municipal electricity supplies in those places. We do not suppose the gas consumers of St. Anne's-on-Sea desire to be relieved of their obligations at the expense of the electricity consumers, any more than they would want to have to meet deficiencies if there was undercharging; and so we have no doubt that they will congratulate the electricity consumers on the reduction of the charges (the latter can well do with this), which reduction wipes out any possibility of securing a substantial sum in aid of the rates. A passing thought is (we have no information on the subject) how stands at the present time the St. Anne's electricity concern in respect of reserves and depreciation.

An editorial article has appeared in the "Electrician" in which it is acknowledged, in as plain language as possible, that there has been a lot of bunkum in the past in reference to the ratings of electric lamps; and we may assume the same thing will continue, despite all virtuous protests. We read: "The rating of an incandescent lamp at 16-candle power is notoriously only the roughest approximation; and it is not so many years ago that arc lamps fell nominally under two headings—viz., those that gave 2000-candle power, and those that only gave 1000-candle power; the actual candle power being neither of these values. An incandescent lamp is usually rated according to its horizontal candle power in some direction, or according to its mean horizontal candle power. In an arc lamp, the mean hemispherical candle power is taken, while its light is never steady for a second at a time; and it is only possible to make an aproximation by some rule-of-thumb method." There would have been some awful things said about us if the authorship of these lines had been in this quarter.

Mr. John Fazakerley, who has been Assistant-Manager for the Whitwood Gas and Chemical Company for the past twenty years, has been appointed, out of 80 applicants, Gas Manager to the Goole Urban District Council.

OBITUARY.

ROBERT SHARPE.

It is with much regret that we record the rather sudden death of Mr. Robert Sharpe, the Gas Engineer and Manager of the Belfast Corporation, which took place at his residence in Ormeau Park, on the 8th inst. He had been indisposed for some little time, but not to such an extent as to cause anxiety. Indeed, he was attending a meeting of the Gas Committee on the 6th inst.; and it was then that his illness became serious. He was conveyed to his home, and his medical adviser summoned. Subsequently further advice was obtained, and an operation was found to be necessary. The patient rallied from the effects of it, and appeared to be progressing favourably; but he gradually sank, and passed away on the evening of the above-named day.

Mr. Sharpe's first connection with the gas profession took place in the works of Messrs. Laidlaw, of Glasgow, where he served his apprenticeship. He was subsequently chosen by the late Mr. Foulis to fill a position in his office at the Glasgow Gas-Works. After gaining additional experience abroad, he was appointed in 1879 Assistant-Manager, under Mr. James Stelfox, at Belfast, on whose retirement at the end of 1906 Mr. Sharpe was promoted to the vacant position. The carrying on of the work that had been so ably performed by his predecessor naturally entailed considerable anxiety; but he discharged his important duties cheerfully and with unassuming assiduity, and served the city with ability and success. Our readers are aware that the question of extending the gas-works is now engaging the attention of the Corporation; so that the loss of so devoted and faithful an official as their late Gas Engineer will be all the more keenly felt. Mr. Sharpe joined the Gas Institute as an associate member in 1887, and was transferred to the class of members in 1890. He passed into the Institution, of which he was a member at the time of his death.

The funeral took place last Wednesday at the Dundonald Cemetery, and was attended by between 1500 and 2000 persons. A large number of members of the Corporation were present, as well as all the employees at the gas-works who could be spared. The cemetery is about six miles from the late Mr. Sharpe's residence; and the procession started soon after nine o'clock in the morning. The chief mourners were Mr. M'Kean (father-in-law) and Mr. M'Kean, jun. (brother-in-law); and following them were: Mr. Stelfox, Mr. David Terrace (Middlesbrough), Mr. J. Whimster (Armagh), Mr. J. Brodie (Lisburn), Mr. T. Frizelle (Holywood), Mr. W. Tallentire (Lurgan), Mr. H. Roberts (Newtownards), Mr. R. Harrison (Monaghan), and Mr. G. Airth (Dundalk); the two last-named gentlemen being the President and Secretary respectively of the Irish Association of Gas Managers.

We regret to record the death, as the result, according to the "Buenos Ayres Standard," of an accident (the nature of which is not stated), of Mr. Arthur Gibson, who went to South America some years ago, and was engaged in the erection of several gas-works in the Argentine Republic, and the remodelling of those of the Buenos Ayres New and South Barracas and Rosario Gas Companies. Towards the close of 1906, Mr. Gibson undertook the construction of the new gas-works for the city of Bahia Blanca, of which an illustrated description was given in the "Journal" for Oct. 22, 1907 (p. 233). They were designed to supply 60 million cubic feet of gas per annum, and were brought into use on Aug. 16, 1907. On their completion, Mr. Gibson returned to England, and resided for a time in a North London suburb. He subsequently, however, returned to South America, and was staying with his wife and children at Mar del Plata when his death occur ed.

PERSONAL.

At a special meeting of the Nelson Town Council last Wednesday, Mr. A. Morton Fyffe, the Chief Assistant-Engineer in the Gas Department of the Dundee Corporation, was appointed Gas Engineer and Manager, in succession to Mr. A. J. Hope, resigned. The salary is £350 per annum, rising to £400. Mr. Fyffe, who is thirty years of age, is a son of the late Councillor Fyffe, of Dundee, and received his early education in the Harris Academy, afterwards attending the University College, where he was first prizeman in 1900 in "Engineering." He entered the service of the Corporation; being apprenticed as an engineer to the late Mr. William Mackison, the Burgh Surveyor. While there he qualified as a civil engineer, and about eight years ago joined the Gas Department as an assistant to Mr. Yuill, the Engineer and Manager, by whom he is regarded as one of the rising men in the gas profession. He has had a valuable experience in everything that pertains to the manufacture and distribution of gas, as well as in superintending reorganization works, and on several occasions he has been consulted by other Corporations on the extension of their gas plant. He was President of the Eastern District Section of the Scottish Junior Gas Association for the session 1908-9, and in this capacity delivered an able Inaugural Address; while at the annual meeting in March last he read an interesting paper on the luteless purifiers at the Dundee Gas-Works. He is an associate member of the Institution of Mechanical Engineers. Mr. Fyffe is another of the Scottish juniors who have lately obtained more responsible posts.

CAUSES OF THE DESTRUCTION OF REFRACTORY BLOCKS AND RETORTS.

By Alfred B. Searle, Ph.D.

Some years ago, when the temperatures reached in various chemical and engineering operations were not so high as at the present time, the ordinary grades of fire-clay were amply resistant to the action of the flue and other gases and to the heat with which they came into contact. But with more intensive operations in modern furnaces, the problems confronting both the user and the maker of gas-retorts, fire-clay blocks, bricks, and other refractory articles become more and more acute.

In spite of the widespread discussions which have recently taken place on this subject, there is no doubt that the fire-clay workers in this country can, among them, produce goods which will satisfy all likely and reasonable requirements, providing that they really know what is needed and also the characteristics of the goods they offer. Among the best firms in the trade there need be little difficulty, providing that the customer is willing to pay the price; but there are many firms in a fair way of business who are still so hopelessly behind the times as to continue making bricks, blocks, and retorts from the same mixtures, and by the same methods, as were used fifty years ago, and are utterly oblivious of the fact that the requirements of engineers have become so much more stringent as to make quite useless to-day many of the older articles, which were satisfactory enough some years ago. Manufacturers who adopt this attitude are usually those who pay no heed to the technical matter published in their trade papers, who think that there is no more for them to learn in the way of clay-working, and who are not aware that competition in this line of business has become so keen that specialists are already building substantial reputations by devoting themselves exclusively to the production of fire-clay goods for one small branch of industry. Yet such is the case; and the more progressive manufacturers are wisely keeping their eyes open to take any hints which they may be able to get, and not a few of them are employing the services of specially trained chemists and ceramists (either in whole or in part) to study the problems as regards their particular works, and advise them accordingly.

In no branch of clay-working is progress more needed than in the manufacture of retorts and blocks for the making of gas; and while there are a few manufacturers who are studying the subject in a thoroughly systematic and scientific manner and who are willing to pay well for all helpful advice and suggestion in this direction, the majority of manufacturers are trying to puzzle out a way for themselves—never noticing that they have not the necessary appliances nor the needed training for carrying ou highly technical and very delicate research work. If a batch of goods is refused by the customer as not satisfactory or as not standing a certain test, such manufacturers try "something" added to their clay, or alter the method of manufacture in some way. Yet real improvement can only come to them by chance; for they do not approach the subject in the right manner. To these, as well as to that large body of intelligent men who are continually observing the behaviour of refractory goods in actual use, and to the engineers in charge of the various gas-works, the following suggestions are made in the hope that they may, to some extent, explain numerous defects and "misbehaviours" and may lead to further improvements in the qualities esteemed so essential in all clay goods used in the manufacture of illuminating gas and the allied industries.

It is, at the present moment, quite impossible to suggest any definitely-worded specification which could be used for all gas-retorts of a particular pattern; for our knowledge of the constitution of clay is still in its infancy, and arbitrary specifications may in such a case do more harm than good, and may impede progress. At the same time, there are certain fundamental characteristics which should be insisted upon; and these may well be considered at the same time as the causes of failure in retorts and blocks.

Temperature.

A primary requisite in all refractory goods is that they shall not be appreciably affected by the action of heat at any temperature to which they are likely to be exposed in use. Unfortunately, there are very few articles used in the gas-making industry which can withstand this test when it is made so severe as in the case of retorts and refractory blocks; though, with care and skill, articles of the necessary heat-resistance can be made. In this connection, it is very necessary to distinguish clearly between (A) resistance to heat or exposure at a definite, high temperature, *per se;* and (B) exposure to rapidly varying temperatures, or to the sudden exposure to heat or cold. Two entirely different sets of phenomena may be observed in the two cases; and they must be kept quite distinct or confusion will result.

A retort or block will resist any given temperature providing it is composed of substances which do not melt, or do not react upon each other to form other substances fusible below that temperature. But to do this it may be necessary that the article shall be heated with extreme caution, and cooled very slowly after treatment. Otherwise, the disturbing action of changes in temperature—see "B" above—may occur. For simple resistance to high temperature (the primary meaning of the term "refrac-

toriness"), pure clay has many advantages over any other material. If sufficiently pure samples are selected—a by no means easy matter at the present time—they will be found to resist a temperature of 3362° to 3470° Fahr., which is much higher than anything yet demanded by a gas engineer. Such clays will be characterized by their high proportion of alumina and their correspondingly low proportion of silica; and while no definite limiting figures can be given, the alumina will seldom be below 33 per cent. nor the silica above 55 per cent.

These figures are quite opposed to the idea prevalent in the minds of many fire-brick manufacturers and gas engineers, who—assuming that, because the proportion of silica is usually the largest of all constituents, it must therefore be the most important—are apt to measure the value of a material by the proportion of silica it contains, whereas in reality they should proceed in an almost contrary direction, as beyond a certain, not well-defined limit, any additional silica only detracts from the refractoriness *per se* of the clay.

Except in the case of the better class fire-clays, however, the chemical composition, as shown by analysis, is but little use as a guide to the heat-resisting power of a clay, though in some cases excellent comparisons may be made by means of a graph in which the ordinates are the percentages of alkalies divided by that of the alumina in the clay, and the abscissæ are the percentages of silica also divided by that of the alumina. The whole area of the chart may then be divided by radiating lines into several fields, each of which represents the limits of composition of materials melting, or rather bending and losing shape, at a definite temperature corresponding to a definite Seger cone.

The only method at present known of determining the heat-resisting power of a block or of a clay is to make a small pyramid of the same shape and size as a Seger cone, and heat it very slowly in a testing furnace alongside several Seger cones; great care being taken that the rise in temperature shall be steady—no sudden variations. The temperature at which bending occurs is taken as that indicating the limit of refractoriness, though it is often (yet quite incorrectly) termed the "fusing point."

To resist high temperatures, a clay must naturally be free from all materials which will unite with any of its constituents to form a fusible mass. The chief of these "fluxes" are lime, magnesia, and "alkalies" (a term signifying sodium and potassium compounds). But, as already remarked, the presence of a large proportion of silica must also be considered as detrimental; for, however refractory silica may be by itself, it is far less heat-resisting when it occurs naturally in admixture with clay. Iron compounds must also be absent as far as possible, as they cause discoloration (which is unimportant) and, in presence of reducing gases from the fuel, form slag-spots in the bricks or retorts.

Attempts have from time to time been made to fix a limit below which no clays or articles shall be regarded as refractory; and the standard generally recognized is that the clay or a piece of the article made into the shape of a Seger cone must not bend at a temperature less than that corresponding to the bending point of Seger cone No. 26. Some authorities prefer a somewhat higher standard, and suggest that cone No. 30 be taken as the minimum, as a number of only moderately good clays can satisfactorily pass the lower test. Owing to the action of heat on Seger cones and fire-clays not being strictly dependent upon the temperature, it is better to use an arbitrary standard which shall show the total heat effect, rather than employ an electrical pyrometer. If, however, the latter instrument is used, it must be carefully calibrated; otherwise, the objection sometimes urged against using Seger cones—irregularity in working—is equally applicable. Cones have, moreover, the advantage that they can be used by people possessing less dexterity in manipulating scientific instruments than is needed for an electrical pyrometer.

The details as to the best method of carrying out this test have not yet been agreed upon; so they need not be described here. It is sufficient to state that the heating must be very slow, or else the results will be false. For this reason, it is highly desirable that some standard method of carrying out this test should be adopted.

It is, however, seldom that mere resistance to a high temperature can be regarded as more than of secondary importance in a retort or fire-brick used in gas manufacture. What is really needed is some assurance that the article will withstand the action of a high temperature under the conditions of actual use, and these are often widely different from those under which the material is tested for refractoriness. Hence a single test of refractoriness is only useful in order to sort out the materials which are necessarily outside a predetermined limit. Many clays may pass the test for refractoriness and yet may fail when made up and used. This is not due to faults in the test, but to the much more trying conditions of actual employment. Thus a clay may, alone, be unaffected when heated to the bending point of cone No. 34, but if heated in contact with fine coke it will bend at a lower temperature than cone No. 28.

This difference in behaviour, due to contact with other materials, is often overlooked by both manufacturer and user; and in some instances sudden "misbehaviour" of a product which has previously been quite satisfactory is due to this cause. The refractory article may at times come into contact with harmful materials in the most unexpected manner; and it is then difficult to ascertain the true cause of the defect. Thus, the writer was asked to examine some retorts made by a well-known firm in the Midlands, and found that several of them were rich in "soluble salts," the source of which it was difficult to explain, until a visit to the works showed that the retorts had been standing for some time on a floor newly-made of ashes. In wet weather, the rain had dissolved some salts out of the ashes; and these had been drawn upwards by capillary attraction into the lower ends of the retorts. The proof of the correctness of this explanation was shown by standing some fragments of retorts in water previously boiled with the ashes, when similar defects were noticed.

The action of gases produced from goods heated near to, or inside, the refractory articles is often important, and will be mentioned later. This action is specially pronounced in the case of new gas-retorts, though the deposit of carbon which is soon formed, rapidly diminishes their action, as it forms a protective coating so long as the material is not adversely affected by reducing gases. As the chief constituent of fire-clay affected in this way is iron, in one or more of its compounds (slags being formed by the action of reducing gases and the silica in the clay), it is important that the iron should be present in as small proportions as possible, and that it should be finely ground.

(To be continued.)

MAUGHAN'S "PEARL" GEYSER.

The accompanying illustration shows a small and compact geyser which has been produced by the Parkinson Stove Company, Limited. It has been specially designed for providing an immediate supply of hot water in situations where only a small quantity is required; and it is claimed for it that it will raise three quarts of cold water 40° per minute, or two quarts to scalding heat in the same time. Should higher temperatures even up to boiling-point be required, they can be obtained at a slower rate. Such a geyser is particularly well suited for use in kitchens, lavatories, surgeries, hair-dressing saloons, &c. It is simple in use—one lever turning on the gas and water taps, and a small pilot-jet lighting the burner. Consequently there is no risk of damage by careless handling.

The geyser is easily fixed by means of screws through the cast-iron bracket shown; and the outlet may be moved to either side, and used to supply two adjacent receptacles. It is made in copper throughout; the interior being tinned, and the exterior polished and lacquered.

Presentation to Mr. P. C. Holmes Hunt.

Our readers are aware that Mr. P. C. Holmes Hunt, the Engineer of the Melbourne Gas Company, is expected to arrive in England shortly on a professional visit. He left Melbourne on the 9th ult., and sailed from Sydney on the 11th in the Canadian liner *Makura*, as he is coming *viâ* Canada. Prior to leaving, he was the guest of the officials of the Gas Company in the Board-room, to wish him *bon voyage*, and also to receive at the hands of the Secretary (Mr. John Hinde), on behalf of the engineering and secretarial staff, a present for himself and Mrs. Hunt, to mark the occasion, and as a slight token of the esteem in which he is held by them. We are assured that the leading officials of the Gas Company and the members of the Victorian Gas Managers' Association, of which Mr. Hunt is the President, will watch with pleasure his mission to England and his appearance at the meeting of the Institution of Gas Engineers, and will await with keen interest his subsequent opinion on carbonizing methods, &c., in the British Isles and on the Continent.

The opening article in the current number of "System and Modern Business" is devoted to the Gaslight and Coke Company. It is entitled: "How an Old Organization Met Competition;" and the author—Mr. George Edgar—shows how, "through losing a monopoly, a firm developed aggressive methods in place of defensive, and in the face of keen competition increased its business." As a frontispiece, an excellent portrait is given of Mr. Corbet Woodall, the Governor of the Company, "who brought about the reorganization of the selling plan to meet changed conditions, and proved its worth by increased business;" and in the middle of the article is a portrait of Mr. Milne Watson, the General Manager, "under whose direction the reorganization of the selling plan was effected, and put on a profit-making basis."

THE EXTENSION OF THE ZÜRICH GAS-WORKS.

(*Continued from p.* 375.)

Retort-House and Retort-Settings.

The earlier carbonizing plant at the works consisted of inclined retorts, which were considered to have advantages over horizontal retorts and have answered well for ten years. This style of setting has recently been superseded by the Dessau type of vertical retorts. When the extension of the works was first under consideration, it was intended to adopt settings of inclined retorts of greater length than those in the older part of the works; but the practical results obtained with vertical retorts afterwards led to the decision to adopt the Dessau system of setting. In the first instance, a retort-house for ten beds of vertical retorts was decided on. It consists of an iron frame-work filled in with walls half-a-brick thick. This method of construction is cheaper and more suitable for gas-works than ordinary brickwork. The principal trusses are constructed with supports in which a certain amount of play is allowed, according to Drory's system. The roof is provided with a ventilating lantern 8 feet high; while there are, in addition, a large number of louvres in the walls of the house for the sake of ventilation. The roof is covered with grooved tiles. Of the thirteen main trusses, two in the middle are specially strong and carry the weight of the supporting framing of the two Bradley conveyors.

The length of the retort-house is 197 feet, and its height is 59 feet. It can be readily extended, when required, towards the east. The main trusses rest on large columns 10 feet deep. The foundations of the retort-house are carried on piles. The foundations of the two benches of retorts, and a portion of the retort-house

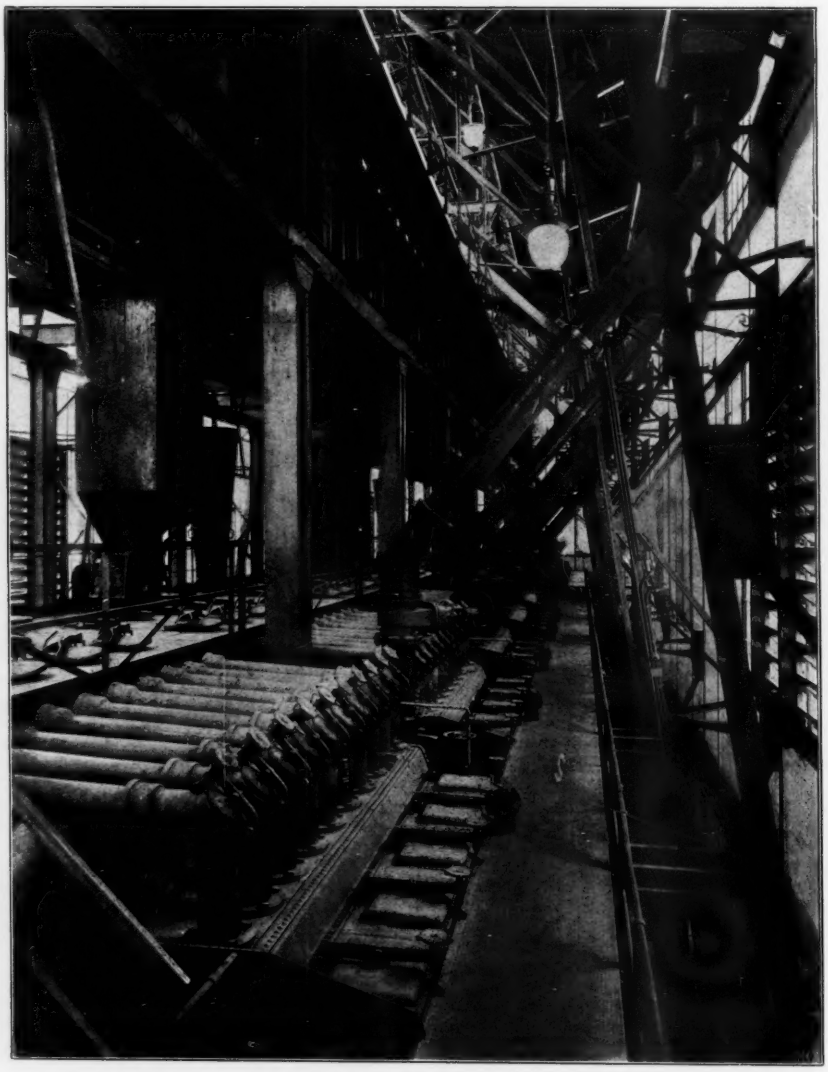

Fig. 7.—Horizontal Gas Take-Off Pipes, Hydraulic Mains, Connections to Foul Main, and Tar and Liquor Overflows.

and of the chimney, consist of very strong beds of concrete resting on a pile framing 16 ft. 6 in. long. In order to protect these foundation beds and the underground passages for the coke-conveyors from the pressure of the underground water, a Monnier construction has been adopted throughout. These extra foundation works involved an increased expenditure of over £1200.

The carbonizing plant comprises two benches of Dessau retort settings, each bench having its own chimney, 115 feet high. There are five settings, each containing ten retorts in the bench. The retorts are 13 feet long, and are built up from two sections. The retort-house and the conveying plant in it have been so arranged that vertical retorts 16 ft. 6 in. long can afterwards be introduced without structural alteration. Between the two benches is a clear space, 17 feet wide, in which are placed the two bucket conveyors, the transverse coke-conveyor leading from the settings to the coke-house, the steam escape shafts, the overhead tanks containing large coke and coke breeze, and the different staircases. The difficulties involved in disposing of these manifold descriptions of apparatus in a practical manner in the space between the benches can only be realized by an inspection of the installation. The disposition of the apparatus in the central passage of the retort-house determined the width of the principal conveying passage in the coal-store.

The buckstays of the benches are very strong, and serve as columns to support the framing on which the coal and coke tanks and the overhead railway rest. The arrangement will be seen from fig. 7, which shows the top of one of the benches with the gas take-off pipes, hydraulic mains, &c. The overhead coal-tanks are 144 ft. 6 in. long, and of such capacity that they contain sufficient coal for 24 hours' working of an installation of ten settings of vertical retorts 16 ft. 6 in. long, which corresponds to about 30 hours' working of the present settings with shorter retorts. The benches and the coal and coke tanks are therefore quite independent of the structure of the retort-house. The travelling conical hoppers for large coke for charging the producers contain three-quarters of a ton. The coal-charging waggons of about half-a-ton capacity travel on a suspension line beneath the coal-bunkers, together with the breeze travelling receptacles, which

are furnished at the bottom with a measuring chamber. Fig. 8 is a view of the top of the benches, with the travelling charging waggons and hoppers. The gas take-off pipes are horizontal, as distinct from the vertical ascension pipes of the earlier types of settings. The gas passes from each hydraulic main through an 8-inch pipe to the 30-inch foul main. The tar and liquor pass through overflows and dips into a cast-iron main, which has a fall of 3 in 100 towards a collecting pit, from which they are pumped into the chief tar and liquor wells.

Steam is introduced into the vertical retorts during the last few hours of the time of distillation of the coal, in order to produce water gas from the incandescent coke. Since the vertical retorts therefore yield water gas as well as ordinary coal gas, the water-gas installation which was contemplated in the original scheme for the extension of the works has, for the time being, been dispensed with. The steam-pipes and accessory apparatus for the production of water gas are on the side of the settings towards the coal-store. The sight-holes for observing and measuring the temperature of the settings are on the same side. On the other side of the settings are the clinkering doors, the regulating valves for primary and secondary air, and the sight-holes for observing the outgoing flue-gases. The large coke required for the producer, and the coke breeze which is put into the retorts before the charge of coal, are raised to the elevated tanks by means of an electric elevator. The motor and gear are placed in a corrugated iron shed supported on strong iron brackets on the specially strengthened central main trusses of the retort-house; so that they are easily accessible from the house.

Coke Conveying and Screening Plant.

The coke as discharged from the retorts is conveyed to the coke-shed and quenched at the same time by automatic sprinklers, in the same way as in the first section of the works. The De Brouwer conveying trough is used as before, as several years' working with the inclined retorts proved it to be thoroughly satisfactory. The channel containing the coke-conveyor is directly under the settings, and a large travelling funnel-shaped waggon serves to direct the coke from the bottom mouthpieces of the retorts into the De Brouwer conveyor. This waggon can be locked at any desired point on the line on which it travels. The disposition of the coke-conveyor beneath the settings affords an economy of space; but, on the other hand, it entails rather more outlay, because the channel in which the trough is fixed must be strongly constructed in masonry. Where space is available, it would be better to place the coke-conveyor directly in front of the settings. The channel is covered with moveable plates, which are taken up in turn to provide the opening for the hot coke to drop from the hopper-waggon into the conveyor. The discharge of the coke takes only a few seconds, and the opening is then closed again. The steam evolved by the quenching of the coke is

Fig. 8.—Charging Stage, Showing the Lids of the Vertical Retorts, the Gas Take-Off Pipes, and the Suspension Lines for Coal and Coke.

thus conveyed lengthwise through the closed channel into the open without incommoding the retort-house staff.

The conveying troughs in front of the two benches meet between the latter a transverse conveying trough 105 feet in length, which, as soon as it emerges from the retort-house, rises at an angle of 45°, and thus conveys the coke to the sorting and breaking plant. The new coke-sorting plant differs from the earlier only in its larger size. The iron tanks for containing the night output are of 6355 cubic feet capacity or sufficiently large to receive the whole of the coke produced at night time, in order that the screening and breaking plant need only be worked in the day time. The tanks are at such a height that the coke can be discharged direct from them into railway waggons or carts. The bottoms of the tanks are also provided with a number of openings for filling sacks with the coke. The same openings can be used for drawing the coke required for the producers.

Scrubbing and Purifying Plant.

A wrought-iron main, 30 inches diameter and 540 feet long, conveys the crude gas from the new retort-house to the new apparatus house. There is a second wrought-iron main of 20 inches diameter and about 490 feet in length, leading from the old retort-house through the coke-shed into the new apparatus house. It has already been pointed out that the old retort-house is now capable of producing more gas than corresponds to the capacity of the original apparatus and purifying plant. The new apparatus does not differ greatly from the older plant. The separate rooms for the condensers, exhausters, tar-extractors, naphthalene and cyanogen washers, final condensers, and ammonia washers are separated from one another by walls; so that the requisite temperature can be maintained in each room. There is a large door in the middle of the partition wall; and on each side of it is a window 16 ft. 6 in. high, so that the attendant can see all the apparatus from either end of the building, which is 213 feet in length and 46 feet wide. In the side of the building are windows from 16 ft. 6 in. to 28 feet high, with openings for ventilation; so that the lighting and ventilation of the building is excellently provided for. At the north end of the building is a laboratory, of which details are given later.

The apparatus is designed ultimately to deal with a daily output of 4,240,000 cubic feet of gas, but provisionally one set of apparatus of half this capacity has been provided. Atmospheric condensers have been dispensed with, in view of the cooling action of the long length of main through which the gas passes to the apparatus house. The apparatus is arranged as follows: (1) Two Bolz condensers, each with 1720 square feet of water-cooled surface and a capacity of 706,000 cubic feet per diem; (2), two exhausters, with governors, driven by special steam-engines,

each of a capacity of 10,600 cubic feet per hour; (3) two Drory tar extractors of 2,120,000 cubic feet capacity per diem; (4) one rotatory Bueb naphthalene extracting washer of 2,120,000 cubic feet capacity per diem, worked by an attached steam-engine; (5) one Bueb cyanogen extracting washer of the same capacity, and similarly driven; (6) two Reutter condensers, with 1720 square feet of cooling surface; (7) one "Standard" ammonia recovery washer of a capacity of 2,120,000 cubic feet per diem.

Roots blowers driven direct from the exhauster are used to pump air into the gas for revivification of the oxide in the purifiers *in situ*. The quantity of air admitted is measured by a special meter of 2120 cubic feet per hour capacity. In the cellar beneath the apparatus house there are two wrought-iron tanks, each of 15 tons capacity, for cyanogen sludge, which is pumped direct from them into tank-waggons. Underground concrete reservoirs alongside the apparatus house serve for storing anthracene oil for use in naphthalene extraction, and the saturated oil after use. The rooms of the apparatus house are heated with exhaust steam from the steam-engines; but in case this is insufficient, provision is made for steam to be taken direct from the boiler-house.

The purifier-house and revivifying floor are designed for a make of 2,120,000 to 2,825,000 cubic feet per diem. The purifiers are mounted on concrete foundations. There is a set of three purifiers, each of an area of 1550 square feet, fitted with ordinary grids. With a make of 2,120,000 cubic feet per diem, the rate of flow of the gas will be about 0·275 inch per second. If the grids are changed for a more modern pattern, the capacity of the purifiers can be considerably raised without increase of the rate of flow. The revivifying floor attached to the purifier-house has an area of 21,100 square feet. Travelling cranes are provided for lifting and removing the wrought-iron lids of the purifiers. A suspension line is used for conveying the purifying material. The waggons on this line can be raised and lowered to meet requirements. The revivifying floor is connected by a turn-table with the standard gauge railways of the works, so that the greater part of the new and spent purifying material can be directly unloaded from the waggons and loaded into them, which leads to considerable economy in wages. The disposition of the revivifying floor alongside the purifier-house is better, both in respect of supervision and working expenses, than the arrangement of the revivifying floor above or below the purifiers.

Tar and Liquor Wells.

The underground tar and liquor wells are constructed of rammed concrete, and differ from those of the first section of the works in that the roofs are constructed in cross arches, instead of as cylindrical vaults. The wells are situated between the apparatus house and the purifier house; and there is a passage round them for inspection purposes. The walls of this passage are formed, on the one side, by the foundations of the apparatus and purifier houses; and, on the other, by the outer walls of the tar and liquor wells. In addition to serving for inspection purposes, this passage accommodates a number of connections and pipes of all kinds which are thus readily accessible for observation and repair. The tar and liquor separating tank has a capacity of 40,737 gallons; the tar well, 117,807 gallons; the weak liquor well 41,838 gallons; and the strong liquor well, 165,150 gallons. The tar and liquor pumps are placed (as before) in the base of the water tower.

(To be continued.)

CALORIFIC VALUES AND HIGH TEMPERATURES.

By G. Stanley Cooper, B.Sc.

In these days of competition and controversy in the field of industry with regard to the relative values of gas and electricity from a commercial point of view, it is as well to know both sides of the case. One of the chief points which arise is the calorific value of the various competitors; but this can be safely left in the hands of those engaged in its industrial application. Now that the adoption of a calorific standard seems imminent, it will be useful to examine the causes of varying calorific value of coal gas and the application of this and other gases for heating purposes.

In order that a calorific standard test should be of any real value, it ought, in the opinion of the writer, to be a high one—certainly not less than 500 B.Th.U. In coal gas, the chief heating gases are hydrogen, marsh gas, and carbon monoxide; and it is therefore necessary to maintain a fairly high proportion of these gases, in order to maintain a high heating power. The calorific values of these gases per cubic foot are respectively—

	Gross.		Net.
Marsh gas	1024 B.Th.U.	..	919 B.Th.U.
Hydrogen	326 ,,	..	272 ,,
Carbon monoxide	323 ,,	..	323 ,,

It is thus seen that marsh gas has by far the highest calorific value; and therefore as high a proportion of this gas as possible should be obtained in the gas. This is best attained by using high heats for carbonization. Again, carbon monoxide has a higher thermal value than hydrogen (net); and so the proportion of this gas might also be increased.

Another matter of some practical interest is the use of gaseous fuel for the production of high temperatures. For work at temperatures of 2500° C. or thereabouts, the electric furnace is used. One objection—though, perhaps, a slight one—to the use of this apparatus is the production in some processes of large quantities of carbon monoxide which remains unburnt. The oxy-hydrogen blow-pipe or air-hydrogen pipe is often used for the production of fairly high temperatures. It is not generally known that by substituting carbon monoxide for hydrogen in the former a still higher temperature is attained. The following table gives the approximate temperatures:—

	Deg. C.
Flame of hydrogen burning in air	= 2024
,, ,, ,, ,, ,, oxygen	= 2844
,, ,, carbon monoxide burning in air	= 1997
,, ,, ,, ,, ,, oxygen	= 3000

It will be seen that whereas the flame of hydrogen in air is hotter than that of carbon monoxide in air, yet when these gases burn in oxygen the temperature of the carbon monoxide flame is much higher than that of the hydrogen. Here we find a natural limit to the temperature obtainable by the burning of one gas in another. The lower hydrogen temperature is due to the partial dissociation of the water which results from the combination of the hydrogen and oxygen on combustion. It has been shown that when a mixture of hydrogen and oxygen in the proportion to form water—*i.e.*, 2 : 1—is ignited, the temperature produced by the combination of a portion of the mixture rises above that at which water vapour begins to dissociate; and consequently for a short interval of time a state of approximate equilibrium obtains, for as many molecules of water as are formed by the combustion are dissociated, owing to the high temperature. During this state, the temperature falls, and rapid combustion again proceeds. It will be seen, therefore, that the limits to the temperature which can be reached by combustion are influenced by the points at which the products of combustion undergo dissociation. The dissociation temperature of water is about 2890°C.; while that of carbon dioxide is upwards of 3500°C.—the approximate temperature of the electric furnace.

Further, too, for many industrial purposes a blowpipe is a handier form of heat supply than the electric furnace. In such operations as brazing, welding, &c., a blowpipe can be advantageously employed. A high heat can be obtained in a very short time with the expenditure of a minimum amount of fuel, and the heat can be applied locally. With regard to the gases to be used with the blowpipe, the foregoing table shows the relative advantages of different gases. Carbon monoxide and oxygen are one of the best combinations for high temperature work; but the former gas is not very readily obtainable on a commercial scale. Coal gas and oxygen form a very efficient mixture; and both of these gases are easily obtained at comparatively small cost. A combination that is used in many works in the North of England is acetylene and oxygen. The oxygen is bought in bulk compressed in cylinders, while the acetylene is generated on the premises from calcium carbide. This is made use of for completing a slightly faulty weld in tubing and in annealing; and it is easily and successfully manipulated. A white heat is obtained in a few seconds. In many such operations in iron-works and the like, a blowpipe is a useful instrument, and should be pushed by the gas industry.

Recent Wills.—Mr. Frederick Tendron, of the Manor House, Bishopsdown, Tunbridge Wells, the Deputy-Chairman of the Continental Union Gas Company, who died on the 14th ult., aged 76, left estate of the gross value of £57,236, of which the net personalty has been sworn at £56,927. The late Mrs. Caroline M. Townsend, widow of Mr. H. A. Townsend, for many years the Secretary of the Bristol Gas Company, left estate of the value of £19,790.

London and Southern District Junior Gas Association.—We learn from the Hon. Secretary (Mr. S. A. Carpenter) that the members of the Association will visit the Bromley Gas-Works next Saturday afternoon; the date having been altered from the 14th inst. to avoid clashing with the Whitsuntide holidays. The annual business meeting will take place at the Cripplegate Institute on Friday evening, the 27th inst., and will be preceded by a "coffee" meeting. The matters to come before the members include the election of Officers and Council for next session; the adoption of the report and balance-sheet; and the consideration of a report by a deputation on the subject of making the Westminster Institute the future meeting-place.

Manchester District Institution of Gas Engineers.—The next meeting of the Institution will be held at Burnley, on the 28th inst., when, by permission of the Gas Committee of the Corporation and their Engineer (Mr. J. P. Leather), the members will be afforded an opportunity of inspecting the installation of Woodall-Duckham vertical retorts at the gas-works, a description of which will be given in a paper by Mr. Leather. Another paper will be contributed by Mr. J. L. Hodgson; his subject being "Venturi Meters for Measuring Large Volumes of Gases." The other items on the *agenda* include the discussion of Mr. Kendrick's Inaugural Address, delivered at the meeting held in February; and consideration of the University scheme of the Manchester Junior Association, the education and authorization of plumbers, and the Institution of Gas Engineers and the work of the Commercial Sections. The Gas Committee will entertain the members at luncheon and "high tea."

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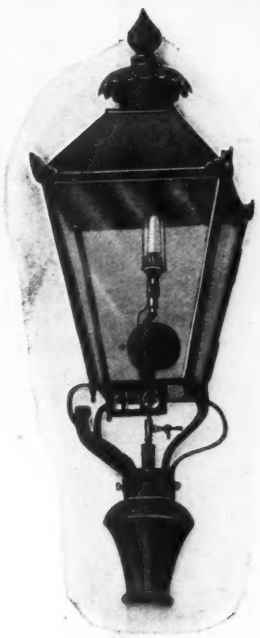

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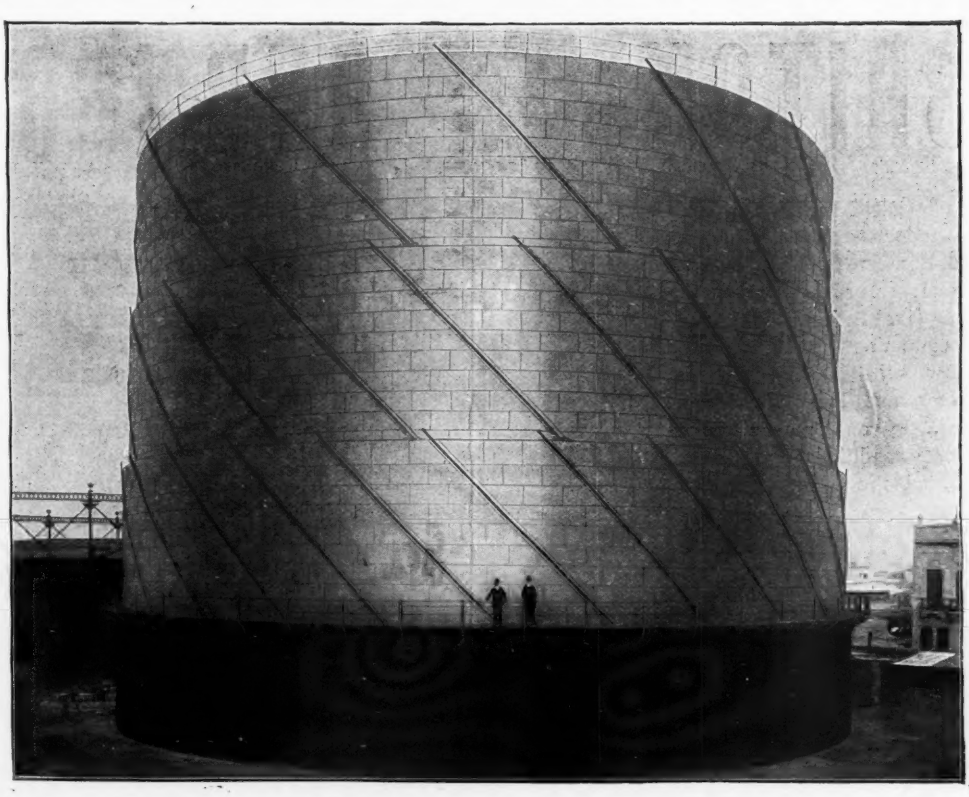

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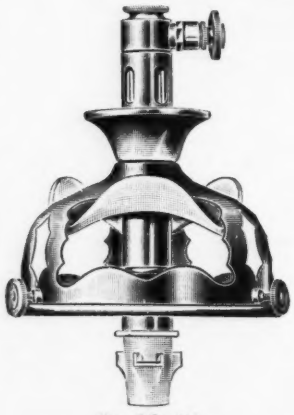

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THE SOUTHERN ASSOCIATION AT BATH.

Although the question of postponement was discussed, in view of all arrangements having been made before the great blow fell upon the Royal House and the nation, and in view too of the fact that prospective engagements would have meant an indefinite delay, the President (Mr. C. Stafford Ellery) and the Committee of the Southern District Association of Gas Engineers and Managers, with the endorsement of the Chairman (Mr. Albert Browning) and Directors of the Bath Gas Company, determined not to cancel the visit of the members of the Association to the historic city of Bath last Thursday; but to carry through the programme, knowing full well that individually members themselves would suppress as much as possible the holiday character of the "outing." That the Committee completely interpreted the feelings of the members was proved by the large number that assembled in Bath. There was a considerable contingent who made the Paddington Railway Station their starting-place at the early hour of nine o'clock; and by various routes a numerous supplement came from the south-western districts, among them may we specially mention—for right heartily welcomed were they—the two veterans retired from the active list, Mr. J. H. Cornish, sen., and Mr. James Lowe. The President of the Institution of Gas Engineers (Mr. James W. Helps) was there, as was also Mr. R. O. Paterson, of Cheltenham, as a guest. Mentioning Mr. Paterson's name reminds that the approaching transference of Mr. James Paterson, of Redhill, to Cheltenham, has prevented him taking up the duties of his recent appointment as the Hon. Secretary and Treasurer of the Association; and Mr. A. F. Browne kindly continued them until this meeting, and, with his old *bonhomie*, shepherded the members during the day, and kept an eye on strict adherence to programme.

The plans made for the visit by the kindness of the Directors of the Bath Gas Company, through the President, were complete in every detail, from the points of view of the technical interest imparted by works inspection, hospitality, and in providing the means for the members seeing something of the wealth of historic feature of the city. Arriving at the station, the members found tram-cars waiting to convey them to the gas-works; and there they were received by, in addition to the President, Mr. Browning and his colleagues, who are: Mr. P. K. Stothert, Mr. James Chaffin, Mr. E. Noke, and Mr. J. E. Commans. Mr. H. Shepherd, the Secretary of the Company, and Mr. J. Bingley, the Assistant-Engineer, were also present.

A Short Business Meeting.

Meeting in the Board-room, a short *agenda* engaged attention.

The President first introduced his Chairman to the members.

Mr. Browning, speaking on behalf of himself and colleagues, gave the visitors a very hearty welcome. He said it was indeed pleasing to them to see such a representative gathering of those connected with the gas profession. After they had inspected the Company's plant, he was certain their report would be that, under Mr. Ellery's judicious management, the works were quite up to date.

The President, in connection with references to the letters of apology for absence that had been received, mentioned, with special regret, that his Worship the Mayor was not well enough to attend.

New Hon. Secretary and Treasurer.

Mr. J. Paterson (Redhill) said this meeting had been formally called for the express purpose of electing an Hon. Secretary and Treasurer. Owing to circumstances that had arisen since the last meeting, Mr. Browne had kindly consented to carry on the work of the dual offices until a successor was appointed, so as to obviate a double transference of duties in a short time.

The President said the Association were in the peculiar position of practically having three Hon. Secretaries at the present time. Mr. Paterson was appointed, but had not done his duty in the office, Mr. Browne had rendered yeoman service, and Mr. W. E. Price, of Hampton Wick, was burning to take up the work of the office. The Committee had looked round with some little anxiety—when it became evident that Mr. Paterson, by force of circumstances, must relinquish the office—to see who would follow on; and it was a great gratification to him (the President), to the Committee, and he was sure to the members generally, that Mr. Price had consented to shoulder the work. Fo.lowing such an admirable Secretary as Mr. Browne, Mr. Price would have no small difficulty in keeping the efficiency of the Association at its best; but they knew Mr. Price's ability so well, that the future, they might rest assured, had in store as much success as the past. He moved that Mr. Price be elected Hon. Secretary and Treasurer.

Mr. J. W. Helps (Croydon), in seconding, remarked that Mr. Price was one of their oldest members. He was not quite certain whether he was present at the birth of the Association; if not, his father was. The name was honourably linked, from the very first, with everything connected with the Association. Present in that room were, he believed, the whole of the members who had served in the position of Hon. Secretary. Fortunately, the Association had not had many of them; but if ever the history of the Association was written, it would be found there that they had had in Mr. Price a gentleman who had carried out the duties of the office in a way that would stand comparison with the work as it had been done at any time before.

The motion was cordially carried.

A Little History.

Mr. Price, in his acknowledgment, said it was very good of the members to give their unanimous accord to the motion. He hoped, in doing so, they had done the right thing—at any rate, no effort should be wanting on his part to make it so. He was, however, a little nervous of the path that had been laid down for his guidance. It was not a broad way, but a narrow and difficult one. The standard had been set so high by those who had occupied the position before, that he feared it would require of him no small amount of work to maintain it. His best endeavour would be to that end. When he knew this change was coming, he was interested in making research to refresh his memory as to what the Association had done; and to make himself rather more intimately acquainted with its early days. Probably there were members now present who were at the inception of the Association. The preliminary meeting to consider its formation was held at the Richmond Gas-Works, on Thursday, July 15, 1875. Some of those who then assembled had passed away; others were still with them. The names of gentlemen who were at the meeting in 1875 were Messrs. James Eldridge (Richmond), Farrand (Croydon), Packham (Kingston), Scott (Tunbridge Wells), Martin (Barnet), Wadeson (Windsor), and Chapman (Harrow). They welcomed Mr. Chapman that day. It was then resolved that an Association should be formed, and be called the Southern District Association of Gas Engineers and Managers; so that the name had not since altered. A Committee consisting of Messrs. Eldridge, Martin, and Chapman, were appointed to draw up regulations for the management of the Association. The first meeting was held on Sept. 16, 1875, at the Bedford Street Hotel; and the first members enrolled were: Messrs. W. H. Broadberry (Tottenham), J. H. Chapman (Harrow), J. Eldridge (Richmond), C. Farrand (Croydon), T. H. Martin (Barnet), T. May (Canterbury), H. F. Packham (Kingston), W. Parlby (Aylesbury), A. F. Phillips (St. Albans), E. Price (Hampton Wick), G. Scott (Tunbridge Wells), J. Wadeson (Windsor), J. West (Maidstone), and A. H. Wood (Hastings). Mr. Wood was the first President, and Mr. Chapman the first Secretary. Though he (Mr. Price) was not one of the original members of the Association, he became a member in 1879. With this brief history of the inception of the Association (which he thought would be of interest), he would conclude by saying that he would in his new office do his best for the Association; and he knew that he might rely upon the individual assistance of the members.

Some Remarks by the President.

The President said he would like to express the hope that what they had done met with the approval of the members in not postponing the meeting that day. The Committee carefully considered whether the terrible calamity that had overtaken the nation by the death of the King should prevent them holding the meeting; but the general feeling as far as they could gather (and his Directors concurred) was that they should not postpone it. They had no excitements or festivities, but were just met as an Association. Had the visit not been made that day, he was afraid that, with the various engagements before them, it would have been impossible to have held it at all. He should like to say how pleased he personally was to see the Association at Bath. This was the third Association of gas men who had honoured them by coming there; and he saw many old friends among the company before him. Everyone was heartily welcome.

Looking round the works the previous day, it occurred to him that perhaps the spring was not the best time to have a visit of this sort. But the members all knew that the process of spring-cleaning had to be gone through; and they were that day in the midst of it. As all gas engineers had to do spring-cleaning, he knew they would recognize it was not being done here with an eye to the visit, but was just the ordinary routine of the works. Another point was that they could not invite the members to see works laid out on an extensive scale, so far as the ground site was concerned; but they could show them works one interesting point of which was that they could make from 3½ to 4 million cubic feet of gas on a very restricted site. The whole of the manufacturing work was done on the north side of the river. He saw Mr. Caddick (who used to be with him) nodding his head; and that gentleman remembered some of the difficulties they had in consequence of this restriction.* He should also like to say a few words about the high-pressure plant for supplying gas to three villages about which he gave particulars at the annual meeting in London. He afterwards saw some criticism of his figures. He should like to say to those who were interested in the figures that, of course (it was almost unnecessary to tell a body of gas men), when one was measuring the passage of gas at pounds pressure, it was a very different thing from measuring at inches pressure; and he did not think the critic quite realized that one could not get, at the second when reading, the exact pressure

* The President no doubt had specially in mind the great flood of some years ago, when almost superhuman efforts were made to keep the furnaces going.—Ed. J.G.L.

pound to pound as inch to inch. The meter was going at such a speed that it was impossible to obtain readings scientifically correct. The second point, as to the discharge of gas through pipes, was also a sort of stumbling-block in the critic's way. If he had properly read his remarks, he would have found that he (Mr. Ellery) gave the discharges through the pipe he experimented with, and for no other; his point being that they got irregular readings through pipes though of the same nominal size. There was such a difference in pipes that they had to be very careful not to accept theoretical figures—in other words, they had to be careful to bring a little commonsense to apply to theory. One other matter referring to the works was that among the shops would be found a room where tests of burners and mantles were carried out; and there were mantles there that had been running from 600 to 700 days.

At the last meeting in London, he (the President) said something as to municipal trading and public lighting. Since he made these remarks, as the members knew, after very careful investigation of the relative merits of electric lighting and gas lighting, some of the chief thoroughfares in London now lighted by electricity were, after a fair fight, to be lighted by gas—both because gas was considerably cheaper and the lighting would be much more efficient. He was sorry the members had had to come to a city where the local authority had failed to learn this lesson. He was sorry to say that it was not upon merits that the dear old City of Bath were doing what they were at the very time London was deciding that the better and cheaper light was gas. Their own city had decided—the reason being that they owned the electric light works—that they must put out the gas in some more of the thoroughfares and instal low-power electric lamps, which would also involve the scrapping of some high-power electric lamps and standards for which a considerable sum of money was paid not long ago. He pointed this out so that they might see the tendency of things. He was glad the Technical Press made such a good report of the actual facts and figures in London.

In conclusion, the President mentioned that Messrs. Stothert and Pitt (whose names would be known to the company as large engineers in the city) and Mr. Cotterell, the Manager of the Bath Stone Firms, had very kindly offered to entertain the Association and show them over their works; but the Committee, feeling the spring meeting was rather one to see the district than for visiting works, had been unable to avail themselves of these friendly offers. Knowing how very kind Messrs. Stothert and Pitt and Mr. Cotterell were, he moved a hearty vote of thanks to them for their invitations.

Mr. A. F. Browne (London), in seconding the motion, said it would have been very pleasing to the members to visit the works of the firms mentioned had there been time. The name of Messrs. Stothert and Pitt had been known to them as engineers for many years, owing to the excellence of their work; and no doubt the work of the Bath Stone Firms was equally excellent.

The motion was unanimously carried; and the business proceedings terminated.

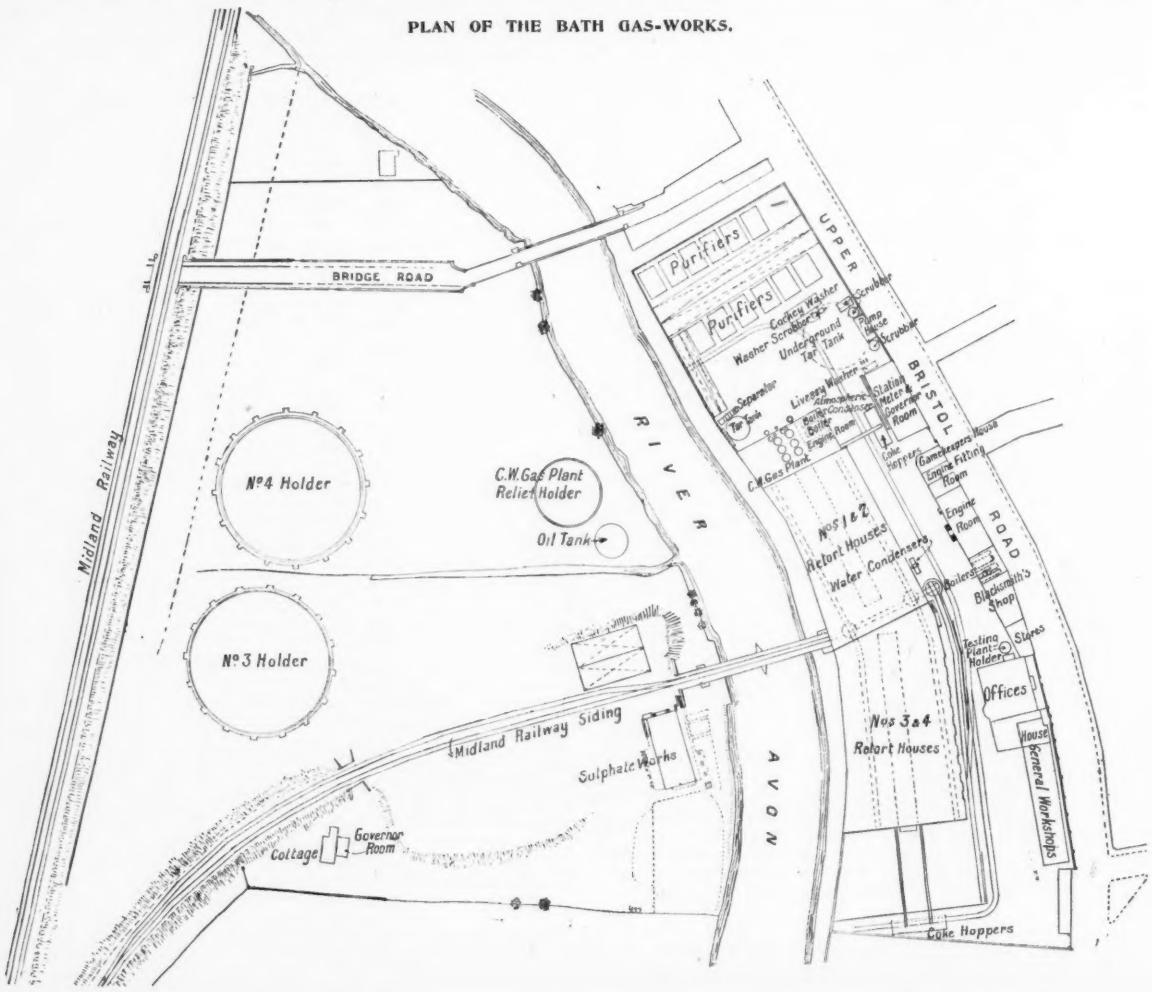
Inspection of the Works.

At the conclusion of the short business meeting, an inspection was made of the works under the guidance of the President, the Secretary (Mr. H. Shepherd), and his assistants (Messrs. Bingley and Pearce). The works, it may be explained, are situated just outside the present city boundary at Weston—about a mile from the Guildhall; and there is also a gasholder station with governor-room at Witcombe on the other side of the city (some 1½ miles from the works), to supply Box, Colerne, and other districts to the east and south-east of Bath. There is also here a compressing plant driven by a gas-engine for increasing the pressure (necessary at present for about one-and-a-half hours on Sunday mid-day, in the the summer time only) to one district about seven miles away. An interesting feature of the works is that the River Avon divides them into two sections—all the manufacturing plant being on the north side; and it is pretty safe to say there are few towns where plant for producing 3½ million cubic feet of gas per day is crowded into so small a space. The gasholders and sulphate of ammonia works are on the south side of the river, where also is stored the bulk of the coal.

It was seen that the retort-houses contain thirty-one settings, each comprising eight ⊏ retorts, 21 in. by 16 in. West's manual stoking machinery, complete with breakers and elevators, is installed in each of the houses. The coke is removed from one of the houses by a conveyor of West's type, worked by 19-H.P. gas-engines in duplicate; and from the other house by a De Brouwer conveyor, operated by 21-H.P. gas-engines in duplicate. The plants are each complete with overhead screens and hoppers. The Midland Railway Company have a siding into the works and retort-houses; and the Company have also wharves on the River Avon, which (as just mentioned) runs through the works.

The gas travels from the retort-houses through water-cooled vertical, and air-cooled horizontal, condensers to the exhauster-room, which contains engines and exhausters in duplicate (one set of 250,000 cubic feet, and the other of 150,000 cubic feet capacity), engine and booster for sending gas to the Witcombe station when necessary, and also compressing plant in duplicate of a capacity of 15,000 cubic feet per hour (referred to in the President's

PLAN OF THE BATH GAS-WORKS.



address, see "JOURNAL" for March 15, p. 723), for supplying three villages west of the city. Adjoining, on one side, is the boiler-house, containing a battery of four boilers for general steam purposes; on the other side is the engine fitters' shop.

From the exhauster, the gas passes to a Livesey washer, which is used for extracting the naphthalene from the gas, by means of oil-gas tar. This was also a subject upon which the President dilated in his address. Three vertical scrubbers (which, it was learned, are filled with blocks of wood) stand on either side of the pump-house, which contains the pumps for both tar and liquor. The plant includes two washers—a 2-million "Cockey" for use in summer, and a 3-million "Kirkham-Hulett" for the heavier make in winter. In each of these, a compartment is filled with oil-gas tar for retaining any portion of naphthalene escaping the Livesey washer. The purifiers are all in the open; open sheds being used for covering the oxide of iron in process of revivification. The station meters and district governors are under one roof. The gas finally on the works passes through a 30-inch and a 24-inch main to the gasholders, situated on the south side of the river, where also is built a gatekeeper's house and a governor room—the governors being employed in regulating the pressure on the south side of the district.

Adjacent to the retort-house is the carburetted water-gas plant, comprising two sections, each of a capacity of 500,000 cubic feet per day, and erected in 1895 by Messrs. Humphreys and Glasgow, with engine-room and boilers. The carburetted water gas, after passing through a "Cyclone" tar-extractor, is purified and measured apart from the coal gas—mixing taking place at the outlet of the station meters. Here, again, is evidenced the restricted area of the works; and it is interesting to observe on how small a space it is possible to manufacture over a million cubic feet of gas per day.

Situated on the south side of the river is the sulphate of ammonia plant, which is equal to a production of about 4 tons of salt per day. The saturator, of the enclosed type, is erected on a platform, and discharges the salt to the ground floor, through a valve fitted on the under side. The waste gases are utilized for heating the acid and liquor, and are purified by passing through oxide of iron heaps, under a shed. Two boilers to provide the necessary steam are fitted in an adjoining room.

Near to the offices are the shops for repairing stoves, meters, &c.; and here also a room was found set apart for the testing of burners and mantles. An account of some of the interesting work done here, it will be remembered, appeared in the Presidential Address.

Among other items of gathered interest was the fact that last year the Company sent out about 642 million cubic feet of gas, through a total length of 131 miles of mains, from which were supplied 16,000 consumers. The price of gas is down to 1s. 11d. per 1000 cubic feet. The Company have show-rooms and offices in the centre of the city; and these (which were opened in 1906) have proved a great convenience to their many customers.

LUNCHEON AT THE ASSEMBLY ROOMS.

In one of the beautiful banqueting halls at the Assembly Rooms, the members were entertained at luncheon by the Gas Company; the Chairman (Mr. A. Browning) presiding. On his right-hand side was the President of the Institution and on his left Mr. Ellery. After lunch, the Chairman referred in words of deep regret to the death of King Edward; and asked the members to drink in silence to the "Health of King George the Fifth." This was done.

Mr. J. W. HELPS, in proposing "The City of Bath," said he had been intimately connected with the city of Bath all his life. He was born near to one of the parts of the gas-works visited that morning; and he was brought up in Bath until he was 21 years of age, and had visited the city frequently since. He regarded it as one of the most beautiful places in the Kingdom. He wished, and they all wished, prosperity to Bath and to its gas and other industries. He added that he received his education in engineering matters at Messrs. Stothert and Pitt's. Regarding the Bath Corporation, he did not know very much. But all present hoped that everything the Corporation undertook would prosper, and that anything they might do with regard to municipal trading might not unduly interfere with the industry the Association represented. All they asked for was for fair play. Given fair play, they could show that if they were not equal to all the demands of the city of Bath they were very nearly so. He had his own opinions on certain matters, but this was not the time to express them.

The TOWN CLERK, in responding, said he recognized that they associated him with the toast in his official capacity as representing the Corporation, who had been referred to by Mr. Helps in terms which he fully appreciated. He came there quite prepared to find that the toast might be coupled with some few observations which at any rate would not leave him without a subject for reply; but the natural courtesy and good humour which pervaded their gatherings had prevented him having the opportunity for dealing with subjects that would require considerable time to put before them. He reciprocated very heartily the expression Mr. Helps had made use of—viz., that there should be fair play. Let them all have fair play; and he did not think there would be any reason for difference between them. He was pleased the Association had selected Bath as the place for their meeting; and they were proud to know the members had selected from Bath the President of their Association. He had had the pleasure, more particularly in recent years, of being closely associated with Mr. Ellery in matters of business; and he could not hope to be associated in such matters with anybody with whom he could expect to get on better than Mr. Ellery. He was one of those gentlemen with whom business matters could be discussed, and all individuality be sunk.

Mr. P. K. STOTHERT submitted "The Southern District Association of Gas Engineers and Managers." He said the Directors of the Gas Company heartily welcomed the Association, and were glad that their Engineer was the President this year. The Directors of the Company prided themselves not a little on the position of the Company, because at the present time they were able to supply an illuminant at a cost comparable with that of almost any town in the Kingdom—and this in spite of the fact that the gas was tested by the old and not the No. 2 burner.

The PRESIDENT, in responding, said it was a great pleasure to him to see so many of his professional friends in Bath; and it was a great gratification to see the Directors of his Company so warmly entering into the spirit of the meeting. He should like to publicly express his appreciation of the way in which his Directors at once entered into the desire for the members of the Association to visit Bath; and he personally thanked them for their kindness. He also highly appreciated the presence of Mr. Wardle. As to gas engineers' meetings, there were usually in a town several men of the same profession (such as lawyers or doctors), but only one gas manager; and if they did not meet occasionally as they were doing that day, for a little friendly intercourse, they would rust or go to pieces. In conclusion, he mentioned that next month he should have been in Bath 30 years; and he was very proud of the city.

Mr. H. W. WOODALL proposed "The Bath Gaslight and Coke Company," remarking that there were many reasons why the Company should be thanked. They had given the members an excellent lunch; and all the arrangements for the day must have involved a large amount of forethought and preparation. The Company had also given the Association their President for the year; and they could not have had a more charming, helpful, or fully-equipped President. From him the members had a valuable address; and on his works that day they had found many things of which to make note.

The CHAIRMAN, in his response, said the Company had keen competition in Bath, and he had no doubt many of those present had to face similar competition. They knew what municipal trading was; but such meetings as this would bring the gas industry into the prominence it richly deserved.

The PRESIDENT said there was one more toast, though not on the list, which they ought not to miss. It was to their late Hon. Secretary and Treasurer (Mr. A. F. Browne). The Association were deeply indebted to him. He was relinquishing office that day; and the members ought not to separate without expressing their appreciation of the services he had rendered to them individually and collectively. Mr. Browne ought to be proud that he was in possession of faculties that enabled him to do such splendid service for the gas industry.

Mr. BROWNE, in responding, said he felt he had been fortunate in having worked with their President for the year. He (Mr. Browne) had worked with four Presidents; and Mr. Ellery made the fifth. To be associated with their President had been a great pleasure. He felt that he ought also to acknowledge the generous way in which the Association had been received by the Bath Gas Company. There had been a great deal to do to bring such a meeting as this to a successful issue. Mr. Ellery introduced to the Committee a rich programme; and it was to the immense regret of the Committee that time would not allow of the whole of it being accepted. This was probably the last official act in his position of Hon. Secretary. It had been a pleasing office; and in it he had received the greatest kindness. Now that it had come to the end, he laid it down with some sense of loss. But if the members had asked him to continue in it, he would have had to say that he was unable to do so.

A DRIVE AND AFTER.

Subsequently, some of the members wandered through the magnificent Park and to see other sights in the city; while the majority went for a motor drive to the top of Beechen Cliff.

On returning to the city the members alighted at the Abbey; and a few minutes later were at the Grand Pump Room, where, with the old Roman Baths as a setting, they were photographed. Thus was secured a striking memento of a visit to a work of great historical and national value. Tea was afterwards served in one of the adjoining rooms. Mr. John Hatton, the Director of the Baths, did all possible to give his visitors interest to the full in the beautiful and wonderful establishment under his control; and after tea Mr. A. J. Taylor, M.S.A., kindly attended to give the members, at the side of the Roman Baths, a sketch of their history—covering the traceable facts as to their construction, and the cause of their loss for centuries, with particulars of their almost romantic discovery in the Eighties. The visitors examined with intense interest the work of those wonderful Roman builders; and not a little admiration was expended over a length of Roman lead pipe (still *in situ*) testifying to the remarkable fertility in resource of the early workers. The floor of the large bath, too, it was mentioned by Mr. Taylor, is entirely covered by lead weighing 40 lbs. to the foot. The water surface of the tank is 82 ft. by 40 ft.; and about 40 tons of lead was used in covering the bottom of the latter. After inspection of features of interest under Mr. Taylor's direction (he was warmly thanked at the instance of the President), a rapid survey was made of the modern baths, which are beautifully constructed and equipped.

Thus ended a most interesting visit—in fact, in such a centre of unique interest it would be a poor individual who did not find much to arrest his attention and to excite his imagination and appreciation. So from this scene of great past and present associations, the members passed their several ways to their homes—feeling grateful to all who had contributed to the day's interest and enjoyment. One thing that was informally done was an instruction to Mr. Browne to make his really last act as Hon. Secretary, the writing of a letter to the Chairman and Directors of the Bath Gas Company acknowledging the exceeding great kindness they had extended to the Association.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Cardiff.

Amid ideal weather conditions, a large muster of the members of the Institution took place last Wednesday at Cardiff, where it had been arranged that the May meeting should be held. The city is, of course, a convenient centre for such a gathering; but we shall probably not be wrong in assuming that the satisfactory attendance was in part at least due to pleasant recollections of a former visit, when the Cardiff Gas Company, as last week, acted a part for which they prove themselves most excellently fitted—that of hosts. In spite of a disappointment—Mr. Thomas Acland, of Llanelly, was to have read a paper, but was unfortunately prevented by illness from attending the meeting—the day was a well-filled one. A paper by Mr. H. D. Madden, the Engineer of the Cardiff Gas Company, on the formation of classes for gas engineering and supply, was the main item of the business meeting; while luncheon with the Directors of the Company was followed by visits to the new Queen Street Show-Rooms and the Grangetown Gas-Works. The members were particularly gratified at the presence, during the discussion on Mr. Madden's paper, of the veteran Chairman of the Company (Surgeon-Colonel W. Taylor, M.D., J.P.) and the Deputy-Chairman (Colonel H. Oakden Fisher, J.P.), both of whom addressed the meeting.

The Meeting.

The members assembled at the Bute Terrace Offices of the Cardiff Gas Company, a room in which had been placed at the disposal of the Institution; and here the business meeting was held, under the chairmanship of the PRESIDENT, Mr. A. H. Brookman, of Tenby.

A WELCOME.

Mr. GEORGE CLARRY (the Manager and Secretary of the Company), before the commencement of the business proceedings, said that, on behalf of the Company, and especially on behalf of the Chairman and Directors, he wished to give the members of the Association a very hearty welcome. He did not intend in any way to interfere with the business of the meeting; but, on the other hand, his Company would endeavour to make the day as interesting as possible. Perhaps the best thing he could do at the moment was to retire, so that the members could commence the proceedings; and then the Company would take on matters again at a later stage. The Chairman (Surgeon-Colonel W. Taylor, M.D., J.P.) and the Deputy-Chairman (Colonel H. Oakden Fisher, J.P.) had both promised to attend during the proceedings at the meeting.

THE LATE KING.

The PRESIDENT said that his first sad task was to refer to the great loss which the nation had sustained by the death of their beloved Sovereign, King Edward VII. They knew that his late Majesty was keenly interested in all scientific matters. He felt that they should give expression to their deep sorrow and their sympathy with the Royal Family in their bereavement.

This the members did by rising silently in their places.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the last meeting; and they were confirmed.

NEW MEMBERS.

The following new members were then elected: Mr. George Clarry, of Cardiff; Mr. Edmund Petty, of the North Pembrokeshire Water and Gas Company, Fishguard; Mr. John Haydon Jones, of Dowlais; and Mr. Frederick C. Mortlock, of Whitland.

REPORT AND ACCOUNTS.

The HON. SECRETARY read the fifth annual report of the Council, which stated that during the year ten members had joined the Institution, two had resigned, and one had died—leaving a membership of 55 at the end of the year. The receipts amounted to £27 6s., and the payments to £28 7s. 2d. There was left, after deducting the deficit of £1 1s. 2d. from the balance of £22 7s. 10d. in hand at the beginning of the year, the sum of £21 6s. 8d. in the hands of the Treasurer.

The report and accounts were adopted, on the proposition of Mr. B. A. LEWIS (Carmarthen), seconded by Mr. A. W. BRANSON (Caerphilly).

ELECTION OF OFFICE-BEARERS.

The following were the officers elected for the ensuing year:—

President.—Mr. J. H. Canning, of Newport.
Vice-President.—Mr. E. H. Swain, of Pontypridd.
Hon. Treasurer.—Mr. Henry Morley, of Teignmouth.
Hon. Secretary.—Mr. Octavius Thomas, of Pentre.
New Members of Council.—Mr. B. A. Lewis, of Carmarthen; Mr. A. J. Ward, of Cardiff; and Mr. T. E. Franklin, of Barry.
Hon. Auditors.—Mr. J. M. Small, of Merthyr Vale; and Mr. F. C. White, of Treharris.

Alderman T. CANNING (Newport), in proposing the re-election of the Hon. Secretary, said the Association were under a deep debt of gratitude to Mr. Thomas; and, in seconding, the PRESIDENT remarked that the time had nearly arrived when they should express their appreciation in some tangible form. He merely threw this out as a hint, he said, for the Committee to deal with at some future date.

SUBSCRIPTION TO THE GAS INSTITUTION BENEVOLENT FUND.

The HON. SECRETARY said they had had a letter from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, calling attention to the financial condition of the Benevolent Fund, and asking for assistance either from the funds of the Institution or by procuring fresh subscribers. Mr. Thomas remarked that, as a member of the Council of the Benevolent Fund, he could say that they really wanted more money. Many deserving cases they were not able to help for want of funds. Less than one-quarter of the members of the Institution of Gas Engineers were subscribers at the present time; and he really hoped some of those in the room would assist. He proposed a donation of £2 2s. from the funds of their own Institution.

The PRESIDENT seconded the proposal, which was at once agreed to; and several members present also intimated that they would contribute privately to the fund.

THE PAPER.

The PRESIDENT remarked that Mr. Thomas Acland, of Llanelly, was to have given them a paper; but unfortunately he was prevented by indisposition from being present at the meeting. Neither had he been able to prepare his contribution. They would therefore have to pass this item. Mr. H. D. Madden had promised a paper on "A Need of the Gas Industry in South Wales;" and he would now call upon him.

Mr. Madden then read his paper, which, with a report of the discussion to which it gave rise, will be found on p. 434.

The PRESIDENT proposed, Alderman CANNING seconded, and the members heartily accorded, a vote of thanks to Mr. Madden for his paper; and Mr. MADDEN acknowledged the compliment.

PLACE OF NEXT MEETING.

The PRESIDENT said there had been some little discussion in the Council as to the place of next meeting. As they had already elected Mr. Canning, jun., as President for the ensuing year, he did not think they could do better than meet at Newport. He moved this.

Mr. BROWNING seconded the proposal, and it was agreed to.

Alderman CANNING expressed the hope that he would see the members at Newport, and said he believed his Board would be as pleased as he himself was to hear that the Institution were going to pay another visit to the town.

THANKS TO THE CARDIFF GAS COMPANY.

The PRESIDENT proposed a vote of thanks to the Chairman and Directors of the Cardiff Gas Company for their kindness in lending the room for the meeting, and for their hospitality. Had it not been for the help they had received from the Company, they would have experienced some difficulty in getting through the meeting.

Mr. J. H. CANNING (Newport) seconded the proposal, which was carried by acclamation.

Dr. TAYLOR said they were very pleased to see the members; and he thought that in going round the works presently they would notice some alterations. There had been an entire change in the organization. They had separated the commercial from the manufacturing element. They did not now manufacture at Bute Terrace at all. The whole of this work was carried out at Grangetown, where Mr. Madden, in succession to Mr. Morley, performed the duties of Engineer most efficiently. They had erected a drawing office there, and put in large and up-to-date purifiers. They had been in the habit of paying the Corporation between £800 and £900 a year for some 32 to 34 million gallons of water; but they had now had a well sunk on the works by Messrs. Isler & Co. When 400 feet down, they found water, which, however, contained a great deal of salt. It would do very well for quenching coke, flushing drains, and similar purposes; but it could not be used in the boilers. Cisterns had been erected to obviate the necessity of pumping all day long. The carburetted water-gas plant was not in action when the members last visited the works. It was now in full operation; and when required in foggy weather, they were able to use a fair proportion of this. It was a great stand-by.

THE LUNCHEON.

At the close of the meeting, the members inspected a Féry pyrometer, the operation of which was explained to them by Mr. Madden; and they then adjourned to the Board-room, where they were the guests of the Cardiff Gas Company—Dr. Taylor being in the chair. The toast list was not a long one.

The CHAIRMAN said they met under a great shadow; for the King was dead. He had reigned for but a short time; but during the nine years, he had endeared himself to all British people. And not only so, but he believed he had won the admiration of the whole world.

He asked them to drink in silence to the memory of King Edward VII. He next proposed "King George V.," and subsequently "Success to the Wales and Monmouthshire District Institution of Gas Engineers and Managers." He said it was extremely gratifying to himself and his Board to find the Institution so soon again visiting Cardiff. It conveyed the impression that they had been pleased with their previous visit. He offered them a hearty welcome. There was no doubt in his mind that organizations of this kind were of benefit all round. Young men were able to learn from the experience of their elders; and they all profited. Their great aim, as gas directors, gas engineers, or gas managers, was to put gas into their holders at as cheap a rate as possible. From small beginnings, gas had gone on until it had attained its present degree of usefulness. How far this usefulness might be still further extended in the future, it was, of course, impossible to say; but within the last few years, it had been extended in directions which they at one time never thought of. They had a great competitor. They were not competitors with the electric light; gas was in existence long before electricity was heard of. They heard sometimes that they were competing with the Cardiff Corporation electricity undertaking; but they were doing nothing of the kind. The Company had been in existence since 1837, and the electricity works he supposed for some sixteen or seventeen years. The latter had been doing a thing which to his mind was wholly illegal. A firm of gas-stove makers came to Cardiff a short time ago, and opened a shop. They applied for gas for lighting; and some high-power gas-lamps were fixed outside the shop. This was too much for the electric light people, who went to a shop next door and offered to wire and light it without asking for a penny. Was this fair competition? He thought it was very unfair; and it was at the expense of the ratepayers. It was known that the installation was not paying; and yet they gave current away in this manner. He was told it was illegal to supply wiring free; and recently these fittings had been removed. The Company had opened a show-room in Queen Street, where they sold gas-fittings and stoves, and explained the principles on which they were based. They were about to establish a course of lectures for ladies; and when stoves were fixed, the working would be explained to them. He hoped the Institution would continue their work, extend their usefulness, and carry into effect the idea Mr. Madden had put before them.

The PRESIDENT, in acknowledgment, remarked that, in coming to Cardiff, they felt that they were almost at home. He was sure of having a good welcome; but as so short a time had elapsed since their previous visit to the city, he hardly expected, when they decided to hold the present meeting in Cardiff, that they would be entertained in so handsome a manner again. He tendered to the Directors the hearty thanks of the members.

Alderman CANNING proposed "Prosperity to the Cardiff Gas Company," coupled with the name of the Chairman. It was, he said, a great pleasure to the members to be received in so hearty a manner by Dr. Taylor and those associated with him. Not only had they been well received, but the presence of the Chairman and Deputy-Chairman had given to the meeting a distinction which otherwise it would not have had. The Chairman was no novice in gas matters; and the management of the Cardiff Gas Company proved this. They all knew how progressive the Company was; and they were prepared to learn, as they learnt before, a great deal from the splendid manner in which the Company had laid down their works, and from the admirable way in which both the engineering side and the commercial side were managed. The Company were very fortunate in their officers. In Mr. Clarry and Mr. Madden, they had two of the best officials it would be possible to find.

The CHAIRMAN returned thanks, and admitted that the Company were in a happy position; for they sent out a good deal of gas at a very cheap rate. He wanted to keep abreast of the times; and if any improvement was heard of, he took Mr. Clarry or Mr. Madden and went to find out the truth about it. They had been to seek a motor-lorry to deliver their stoves; and they even wanted to find a little motor to carry the coppers from the slot-meters. There was daily collected something like 4 cwt. in pence. He agreed that they were exceedingly fortunate in having two such officers as Mr. Clarry and Mr. Madden; and then there was Mr. A. Williams, the Works Superintendent at Grangetown. The commercial and engineering departments had been separated, with beneficial results. He proposed the health of Mr. Clarry and Mr. Madden.

Mr. CLARRY, in acknowledgment, said nothing would give him greater pleasure than to further in some way the interests of the Institution. He would ask the members, before going to the works, to give some consideration to the sales department. During the last few years very great strides had been made in this direction; and he hoped that the efforts that the Company had been making would be of benefit to the members of the Institution as well as to themselves. People coming into Cardiff would see the new show-room; and he felt sure the members would find it an incentive in their different districts to make use of the latest methods of consuming gas. So long as they had Cardiff to watch over the interests of the industry, gas would not fall into the background, but, on the contrary, he believed would prosper even more than it had done in the past. They wanted to keep both themselves and their consumers abreast of the times.

Mr. MADDEN also briefly returned thanks, and said he had always found it a great pleasure to work with Mr. Clarry under such a Board as they had.

The Queen Street Show-Room.

A visit was paid to the Bute Terrace stores, where the members admired the ingenuity with which an old retort-house has been converted to a clean, well-lighted, double-galleried store for fittings required on the district. The building is specially fitted up for the purpose of concentrating under one roof the whole of the stores required in the Company's fittings department; and ultimately the stores will be sectionalized into prepayment, ordinary meter, services, and general fittings. At present the goods are delivered in the district by a spring cart; but the Directors have recently placed an order for an 18 H.P. motor-van.

Brakes were then requisitioned to convey the party to Queen Street, where the new show-room was inspected with interest, under the guidance of Mr. Clarry. So handsome are the goods on view, and so tastefully is everything arranged, that it is difficult to suppose a consumer could look round the stock without feeling an almost, if not quite, irresistible desire to purchase or hire something. The premises, which have only been open a few days, are in every way excellently suited to fulfil their object of displaying to the best advantage the many uses to which gas can now be put in the household and for business purposes. The facilitating of the payment of accounts is another point. A counter is provided for this purpose, and—it is not near the door. The consumer has to traverse the length of the show-room—a journey which, as he looks about him, he will no doubt feel pleased that he has been obliged to undertake.

It may be remarked that the show-room is about 100 ft. by 20 ft., on the ground floor; and it has a large front window, the special attraction of which will be illustrative features in lighting and heating by gas. At the far end of the room is a small lecture or class room. This it is intended to utilize for the purpose of giving instruction to ladies upon the use of gas for cooking and domestic purposes. A qualified lady demonstrator will be in attendance daily; and classes will also be formed for giving instruction to domestic servants in the evening. The lady demonstrator will during the day visit the houses of consumers for the purpose of giving expert advice when required. Over the facia, eight Keith high-pressure incandescent gas-lamps, each of 1500-candle power, have been installed, in addition to which two high-pressure lamps of 500 candles are fixed in the lobby. The compressor is placed in the basement. An automatic control is fixed; and all lights can be turned on and off from the basement. Ventilation of the show-room is carried out by means of a Keith-Blackman reversible fan, which enables the entire air of the room to be changed every fifteen minutes. The window can be lighted by means of switches; the board controlling thirty lights. The ceiling-rails are designed in oxidized silver tubing; and the show fires are connected up to flues—each fire being controlled by a switch-tap in the basement. A bath-room system has been fitted up with a "Lightning" Geyser, supplied with shower and lavatory arrangement, also a "Wilson" hot-water circulator, with tank. A Parkinson "Pearl" geyser is fixed for the lavatory basin; while provision has been made in the basement to supply hot water for kitchen and other purposes by means of Potterton's "Victor" gas-boiler.

At the Grangetown Works.

After this practical demonstration of the progressive spirit of the Company, the drive was resumed to the Grangetown works, where the visitors were taken charge of by Mr. Madden, Mr. J. Parry, and Mr. A. Williams. Here, also, they saw that nothing is allowed to stand still. Short as was the time that had elapsed since the previous visit of the Institution, numerous additions were noted at the station, which covers 18 acres of ground, and is capable of producing 7 million feet of gas per day. On entering, the first additions seen were the new and roomy offices for the accommodation and concentration of the engineering staff; and the pump-house, tank, and machinery, which is now providing water, as had been stated by the Chairman during the meeting, from a well sunk 407 feet deep. Proceeding, the members came to a new mechanical screening plant for sorting breeze and working in conjunction with the existing coke-handling plant. This was made and erected by the Company's workmen, and delivers the screened sizes directly into carts or railway trucks.

There are at the works two large retort-houses. One of these has 35 beds of regenerators equipped complete with West's compressed air stoking machinery, coal-handling plant, hot-coke conveyors, coke-storage hoppers having a capacity of 400 tons, and a long gantry and travelling crane which is used for storing in the yard. Eight-hour charges of about 9 cwt. are worked; and they are found to give great satisfaction, not only from the gas point of view, but from that of residuals also. The members were able to see the operations of discharging and charging; and the evenness of the charges in the retorts was commented upon. Investigation is in progress as to the calorific value produced under different conditions of working with refinements to the dip-pipes and hydraulics, &c.

Just now this house is being extended to forty through beds of retorts; the walls, foundations, and settings being well forward. As was stated in the "JOURNAL" for the 5th ult., the Directors have, for this extension, placed an order with West's Gas Improvement Company for one of their new power stokers for horizontal retorts, an illustrated description of which was at the same time given (see pp. 24, 25), with coal and hot coke handling plants. As this machine—we understand the one at Cardiff will be the first of the kind installed—charges and discharges the retorts in one operation, the furnaces are placed on the one side.

The second retort-house contains 38 beds of retorts, hand-charged; but it is not now used. There is no doubt, however, that at a later date it will be converted to a modern system of carbonizing.

Some time was spent round the new purifying-house (one of four, each having six boxes), an illustrated description of which appeared in the "JOURNAL" for Nov. 23 last (pp. 526-9). The purifiers are fitted with Spencer's patent hurdle grids; and they are worked by means of two Pickering patent centre-valves, one of which controls the four larger boxes, and the other the two smaller ones.

At Grangetown, further suggestions can be had for the utilization of old retort-houses. The carpenters and pattern makers are accommodated in a roomy building which once formed part of a retort-house. Mechanical tools and power are well provided, and the engine-shops are being further equipped with modern high-speed tools, to cope with the necessary work. The Directors are—and rightly so—firm believers in being equipped with modern apparatus in every branch; and at the manufacturing station, as in the other departments, "Progress" is certainly the order of the day.

The carburetted water-gas plant is a still further instance of good use being made of disused retort-houses. The plant is accommodated in old converted retort-houses which are now, respectively, boiler-house, plant building, and engine-room. At the present time, two 1 million cubic feet per day sets, complete with machinery, are installed; but sufficient room is left, and the foundations are ready, to receive two more sets, should they be required. A feature of this carburetted water-gas installation, as has been pointed out on previous occasions, are the twin generators, which are found very useful. What has been done is to provide three generators for the two sets—that is to say, there is a spare one which is connectable with either set. It is, of course, in connection with the generator that most of the wear and tear arises; but by the adoption of the "twin" method, it is always possible to keep the two sets going.

The governor-house is being extended, and two new governors are being installed. One (a 24-inch) has just been brought into operation, in conjunction with a 24-inch trunk supply which is being carried out to the district; while the other (an 18-inch) is to act as a safety-governor between the inlet and outlet mains. Provision is also being made for excellent mess and bath room accommodation for the workmen.

Regarding sport, the works may claim to be the first in the Principality. Teams of riflemen and base-ball players form part of an institute of which Mr. Madden is President; and this year the teams have been most successful. They have won both the Senior and Junior Challenge Cups of the Cardiff and District Rifle Club, and last summer brought home the championship in the shape of another challenge cup for base-ball. To encourage further efforts, the Directors (as stated by the Chairman) have taken a 4-acre field adjoining the works as a recreation ground for the men; and, as will have been gathered, the Board give their wholehearted support to everything that is for the good of the working men co-partners.

At the conclusion of the inspection, tea was served in the old carpenters' shop, which is now given over to ambulance classes. This having been partaken of, the President called for three cheers for the Cardiff Gas Company and the staff. Dr. Taylor, in reply, said that the Company would do all they could to earn another visit from the Institution on a future occasion, when, he hoped they would find further improvements in the works.

The visitors were then driven back into the city, where they dispersed, after having spent what was generally agreed to have been a thoroughly successful day.

A NEED OF THE GAS INDUSTRY IN SOUTH WALES.

[A Paper Read at the Meeting of the Wales and Monmouthshire Institution, May 11.]

When this subject was brought forward and discussed at the last meeting of your Council, it was with some diffidence that I promised to carry out their wish to introduce the matter of the needs of gas education for the South Wales and Monmouthshire districts, as I felt it could have been more ably dealt with by other members of our Association. The object of your Council is to draw the members' attention to the fact that at the present moment no public tuition is available in South Wales for those who desire instruction and technical training in the subjects of gas engineering or gas supply; and it is felt that it is a matter that should receive our earnest attention, with a reasonable desire of a remedy and a hope that the gas industry will be well represented in the Technical Colleges of the district.

It is somewhat surprising that a large and populous district like ours, full of gas-works and coke-oven installations, should be entirely unrepresented and be without place in the curriculum of the Technical Colleges in the many towns of South Wales, especially so when one looks at the advantages enjoyed in other populous districts like the Midlands, Yorkshire, and London areas, where the industry has exceptional training classes available for gas men who desire special instruction in either manufacture or gas supply, with the sister handmaiden of chemistry and engineering. Locally, the mining and mechanical professions receive the full amount of attention they naturally merit in such an important mineral and industrial country as South Wales; and as twin brother to these, let us move forward and ensure like advantages, so that the gas industry takes a prominent place in the technical programme of education and receives the prominence that a scientific industry so naturally deserves.

It is, I feel, quite unnecessary to bring forward any plea in support of the advantages of technical education in gas matters, as one and all recognize that a thorough knowledge of the inner truths of the science is becoming more necessary each day, and is vital to the well being of gas and its development. To-day the rule-of-thumb is gone, and science and a proper understanding of gas questions become more imperative, both on the works and with the distributing departments. Results and economies of production, with a consequent low selling price of the article we manufacture (the most important factor in the stability of the industry), can be materially assisted by trained minds engaged in the daily routine of our work. Work, enthusiasm, and systematic and intellectual thought on the complex questions are engendered and encouraged by properly applied technical classes, with a result that must be beneficial to gas undertakings and to the industry at large.

The value of the gas-preparation classes has been for years emphasized by our friends, the "JOURNAL OF GAS LIGHTING" and the "Gas World;" and I would draw your attention to some salient remarks on this year's examination and its value, taken from a leading article recently in the "Gas World": "There is a technic for both gas manufacture and distribution which can only be thoroughly mastered by practising it for a sufficiently long apprenticeship. The old hands in this service were prone to believe that nothing more was necessary. How narrow was their outlook may be perceived on inspection of their records, of their papers, and of so-called inventions which had no foundation in Nature. What has now to be done is to bend the general teaching in science, which is so readily available at the present time, to the elucidation and the guidance of the technic, which is also widening out and taking on developments utterly beyond the ken of the self-taught craftsmen of an earlier day. They were in many instances wonderfully good men, within their limits; but it is time to recognize that, speaking generally, the era of the self-taught man is past. There is far too much to be acquired in all arts for the ablest to have time for laboriously working his way unaided from the beginning to the front rank, where everyone wants to find himself, in good health and with plenty of open ground still before him. Not the least valuable office of these carefully prepared examination papers is the indication they supply of the right road for a student to pursue."

In other parts of the country where gas classes are held, the benefits conferred can be plainly seen in the able papers read and discussed by the Junior Institutions, that have their foundation and origin in the college classes which trained and educated them. The German gas-works have fully recognized the importance of being in earnest in this matter, and have provided most thorough courses of systematic technical training for all branches of employees, which has been carried out with characteristic thoroughness and borne fruit of the highest order in the scientific research and practical application of the truths discovered, to the great advantage of their gas undertakings. The gas industry cannot, and will not, stand still; and knowing and seeing the beneficial results of classes, as an Association morally responsible to our parent, the Institution of Gas Engineers, for the welfare and advancement of gas in the Principality, we cannot stand inert and allow the present condition of affairs to remain unaltered.

Without labouring the point, the suggestion I would respectfully place before you is that we, as an Association, might do something tangible, by practically promoting and assisting in the formation of classes for gas manufacture and supply in the South Wales and Monmouthshire districts, and do away with the necessity of our students travelling tremendous distances out of South Wales to obtain tuition, and to sit for examinations for these subjects.

Commercial knowledge and the gift of handling men cannot be taught in these classes. The works and the office must provide these lessons; but such lessons teach the theories which govern the laws of our daily work, and which, if properly applied, are so important a guide and factor in the successful issue of the same. Furthermore, to ensure practical success, I feel that we should follow the matter up, and continue to foster and watch over the courses of training given, so that overlapping is obviated and the curriculum arranged and guided, for systematic and progressive tuition, in each branch—viz., for the engineering and the lighting departments—in order that the fullest advantages may be provided and given to the different grades of students, and carry lasting benefits to the undertakings we are all proud to serve, and who, I am sure, would welcome and assist our Association in a project so closely allied to their welfare.

In a primary movement of classes—the ordinary stages only can be provided, the honours courses following in due sequence—the writer hopes that, by careful guidance of the Association, this may not be the end, and that ultimately we may see in our district the same provisions as are founded by the German gas organizations—viz., lectures in carbonizing technique and gas-fitting practice; so bringing the latter trade to a higher plane than it stands at the present moment. The day of the specialist is here; and provision must be made for it. The great forward movement of the outside department is a type of this same specializing in which, if men are to keep pace with the modern developments in the uses of gas, they must intelligently learn the fundamental laws of light, heat, and power.

If we, as an Association, put our hand to this business, let us make up our minds to do it with a thoroughness that cannot be mistaken, accompanied with an earnest desire to see the industry in South Wales at least as well provided technically as any other part of the kingdom.

Discussion.

The PRESIDENT said they would all agree that Mr. Madden's paper dealt with a subject of the utmost importance to the gas profession. The question of the importance of scientific training in connection with gas manufacture and distribution was one of the leading problems of the day. One point was the difficulty of getting technical scholars to pass examinations. For one thing in Wales the distance they had to travel was a great obstacle.

Alderman T. CANNING (Newport) (after remarking that he had waited to see if someone else would speak first who would probably be able to give a more practical and more definite idea of exactly what were the difficulties they laboured under than he might be able to give himself) said Mr. Madden was to be highly complimented upon his paper, which was a very suggestive one. He thought at the opening the author stated that no public provision was made in South Wales for the teaching of gas engineering and the principles of gas supply. There was no difficulty in having classes of this kind, especially in any of the technical institutes in the large centres. At the present time the position was that in this country education was free so far as it was elementary; but when they got above this stage, it was not free. When, therefore, application was made to a technical institute to found a new class, the committee desired to know first of all how many students there would be in the class, so that they could fix a fee accordingly, to cover the expenses of the teacher, &c. This was not a large sum. He did not know whether Mr. Madden's views were that their Institution should make some arrangements of this kind—that was to say, make provision, so to speak, for paying the very moderate expenses, after all, of the teaching, the opening of the classes, &c. Of course, these fees were in no instance heavy; being merely designed to meet current expenses. The use of the building and its equipment would be entirely free of charge to any students who came to the institutes. Next, he did not know who the students were that Mr. Madden intended should become recipients of this technical instruction. He did not know whether he meant those who had already finally made up their minds to carry on the work of the gas profession, and had entered on terms of pupilage, because he himself would certainly not recommend anybody to go to a technical school or to attend any public lectures in college or secondary schools with the idea of acquiring merely theoretical knowledge. Such classes ought to be attended by persons who were already engaged in the gas business. If they looked at the matter from this point of view, he was very much afraid that, unlike the Midlands or the North, they had no centre (except perhaps Cardiff) which would be able to supply the eight or ten pupils that the technical instruction committee would undoubtedly ask for before they would appoint a teacher. He thought that the committee would be well satisfied with an average attendance of six during the session. But in order to secure this, they must always have a larger roll of students. The matter was a very important one, and must be considered from the practical point of view, as well as from another aspect—the great need at the present day of having young men properly trained, and enabling them to compete with those who, as Mr. Madden had pointed out, were well trained in other districts. This was the hardship of the case. On the one side, there was the practical difficulty of getting a training; and, on the other, the absolute hardship of having young men brought up in Wales under somewhat inferior conditions to their more fortunate brethren elsewhere. He thought this was rather the point. Let them see whether there was also any other class. Mr. Madden referred to a second class, who, he said, were instructed in Germany—that was to say, those who had to do, not with the engineering pure and simple, nor with the distribution in its higher departments, but in its more mechanical application. They might consider for a moment or two the best way of meeting both these classes. First of all, he would speak of the higher grade—those who were destined to take up the occupations which the members of the Institution were themselves following; and then he would refer to the other grade—those who dealt with the every-day mechanical portion of the operations that had to be carried out on a gas-works or in connection with a district. It was not much use—in fact, it was no good at all—to send a young man to a technical school, if they wanted to make him an engineer, unless he had had previous good training. It was quite the same thing as putting corn seed on an unploughed field, to send a young man into a technical school, or any school of a technological character, without previous preparation. He would not understand either his teacher or his fellows. It was not to be expected, in a building of this kind, erected at very great cost, that the public should have to provide education which ought first of all to be furnished elsewhere; and a young gas engineer who became a pupil at a works, or started on a small salary in the office, before he went to the technical institute, ought to have reached about seventeen years of age. Since secondary schools were now to be had all over the country, he should have had some suitable training; and, in justice to the public he had to serve in the future, it was necessary that this training should be far and away beyond that provided in elementary schools. Personally, he thought such a young man ought to have a good knowledge at all events of English. He should be able to read it, spell it, and speak it; and he should be fairly well grounded in history and geography. He did not know whether at the present day Latin as a language was of great practical importance; but personally he considered it of vast importance as an educational instrument in connection with modern languages. Therefore he would not entirely prohibit a boy from learning Latin—he would let him go a certain distance with it, at any rate. To his mind, it seemed that a youngster of seventeen, intending to take up the profession of a gas engineer, and to enter a technical school, should know something of French and German; while mathematics was another subject of which he should not be ignorant. Otherwise he would not understand the language in which the teacher would speak. Of course, the teacher would not go over the elements. Each particular department in the educational establishments nowadays should take up its own work; and a youth should be passed from one stage to another without the necessity of going back over anything that he ought to have learnt at a previous stage. As to the training of a young gas engineer, he would say that he ought, before going into one of these classes, to be also well up in elementary physics and chemistry. This he (Mr. Canning) looked upon as a *sine quâ non*. Drawing, too, was another thing. Of course, he was referring to young people who really intended to follow the occupation of gas engineers. He did not think for a moment that Mr. Madden intended they should send a boy out of the district to such an establishment (say) as Owens College, Manchester, and set him down to learn gas engineering theoretically.

Mr. MADDEN: No.

Alderman CANNING (continuing) said that therefore there was no need to discuss this. Many of those present had sons in the gas profession. It had always been one of the prolific branches of the race; and there were invariably a great number of gas engineers about to be trained. He would assume that the foundation had been laid; that elementary physics had been learnt; but no mechanics. Mechanics taught at a school, from his own personal experience, proved a veritable delusion. They should leave it out of the elementary and secondary school, and trust to learning it in the technological institute. He did not think that when young lads came out of the secondary school at the present time there was any really satisfactory account given of them. There ought to be, where matriculation examinations had not been passed, other certificates—what might be called "Leaving Off Certificates," to show the advance that had been made by the pupil while in the school. To return to the subject of the paper, he wondered how they could get a sufficient number of students for what he called the higher programme. Perhaps in Cardiff Mr. Madden had enough round his own establishment; and if so, he imagined there would be no difficulty in getting the Committee of the Technical Institute there to arrange for a class—unless some reasons existed which he himself did not understand. In other places, however, they would have to combine. Take Newport for example, there would not be sufficient going in for gas engineering to warrant opening a class there. Students from that place would either have to come to Cardiff, or those from Cardiff would have to go to Newport. Probably Cardiff and Newport and neighbouring places might combine in this way; and with other towns it might be possible to do something of the same kind. Swansea, for instance, would be a grand centre. It had one of the foremost technical schools in the country. He was able to say, as a Governor of the University of Wales, that it was the only technological school that was affiliated to the University; and any student following courses of engineering there, or following out metallurgical studies, would be able, by passing his examinations there, to matriculate and to graduate in the Welsh University. In the neighbourhood of Swansea people could easily group themselves together, and send one or two pupils from one town and another. But now with respect to the attendance at the schools themselves. He did not think that the system they had been pursuing—because after all they had been pursuing some system in this matter—was altogether satisfactory. Young men should not take up too many subjects. There was a tendency to do this, but it was better to take up only two or three. Another thing that operated against these classes was that they were usually held in the evening. The students were at work during the day; and he said advisedly that, not only bodies who had charge of gas-works, but those who were in charge of mines, factories, &c., throughout the kingdom, should allow their pupils and apprentices a certain portion of each day's time to leave their work and go to the technical school to obtain another portion of their training. They should regard this as one of their biggest assets. It was a plan that had been adopted with most notable results in the case of those engaged at the Alexandra Docks, Newport. He hoped in time it would become universal, as after all the training of an engineer, and especially of a gas engineer, must be partly practical and partly theoretical; and it was advisable that they should run together in this country, because this was more in accordance with prevailing ideas. If they looked at Germany or America, they would see the student had first a one or two years' course in the workshops. Then he quitted them and went to the technical college for (say) four years, and then back to the workshops once more. But he thought they could scarcely hope to induce the British people to adopt this system. To attach too much faith to school—to believe too much in school—was not a characteristic of the Briton. He liked to see something practical done as well. This being so, he would say that employers of labour should not hesitate a moment before allowing the pupils in one department and the apprentices in another to attend at suitable times in order to obtain a theoretical and scientific knowledge of the business of which they were acquiring day by day on the works themselves an applied knowledge. For, after all, at the present day the work carried

on must be scientific. Applied science was essential; and the question could only be dealt with in the way he had pointed out. Another side of the subject was the instruction that ought to be given—he was not now speaking of engineers or scientific men—to those who were employed on the works actually. First of all, would the rule-of-thumb man do any longer in the retort-house? In large works the changes made had been very great. The construction of the furnaces, for instance, had been complicated; and it was necessary to watch the furnace gases produced, and to be able to tell whether everything was right or not. When, also, they took into account the fact that there was a great deal of machinery in these houses, they would admit that the foreman should surely be a man who understood a little (if not much) about construction. He should at least know when to call the chemist's attention to the furnace gases in connection with the carbonizing, as well as be sufficient of a mechanic to comprehend the machinery under his control. It was unnecessary to go through every department of the works. The members realized that everything was changed. When they came to the engine-room, it was the same; and with the altered methods of distribution, with high-pressure gas and compressors, and with the new demands which called for such frequent changes of pressure, they required not only smart and sober men, but also instructed ones. When they came to the outdoor department, the case was even more pressing. A well-trained, skilled man was required in connection with all the modern gas-fitting. It was not the slightest use to hand over the maintenance of new incandescent burners to the old style of gas-fitter, for he was certain to blunder. He was either too proud to learn or so far petrified in his ways of working that he regarded with scorn whatever might be said to him. They could train a youth; but they would find great difficulty in training grown-up men, and making them understand that the very reverse process was taking place in the burner now to what used to be the case. Many a consumer was offended or lost from want of technical and practical knowledge on the part of those who were sent out even to attend to the small operations of fixing mantles and maintaining gas-burners; and the same thing with cookers and fires. This being the case, there ought to be started classes for this kind of instruction; and there should be no difficulty, for sufficient students could always be provided. At Newport, they had already classes for plumbing and things of that description. He would suggest gas-fitting, the study of the gas-engine, and the elementary principles of heat—sufficient to enable a foreman to know when to direct attention to things going wrong, and to give the gas-fitter a full understanding of the burners that he had to deal with. It was, of course, most important to have a good teacher; and also, as he had said before, to give their employees, be they few or many, sufficient opportunity for attending the classes, without taking up the whole of their evenings. It did not seem to him impossible to carry out the proposition Mr. Madden had shadowed forth. He was, however, insistent on the fact that, without the proper grounding for the knowledge he had mentioned—a good English knowledge, a good mechanical training, a knowledge at least of elementary physics and chemistry, and some acquaintance with modern languages—no young man ought to set out to take up the duties of an engineer or learn the business of an engineer. He was only prepared when he had started with this. On the other hand, he (the speaker) was equally convinced that until a little more training in applied science on its practical and elementary side had been given to the gas-fitters and others connected with both indoor and outdoor departments—with every operation, in fact, from carbonizing upwards—they would not be able to have about them men who could be really relied upon. A man who was a blunderer might work an undertaking irrevocable harm. He therefore trusted that the outcome of Mr. Madden's paper that day—which touched upon a very important matter—would be seen in a practical movement. Everything about them with regard to their working had within the past ten or twenty years absolutely changed, and had become scientific. Those who joined the profession in future must know that it was a complicated machine and no longer a plough to which they put their hands.

Mr. Octavius Thomas remarked that the subject was interesting to him because he had a son starting in life, and also because he was very anxious that the gas-fitters should have some training. Really half the trouble of a gas manager to-day arose from the fact that people would not keep their burners clean or look after their engines or stoves. The winter before last, consumers in a portion of his district tried to worry the life out of him with complaints of bad gas, want of pressure, and that sort of thing. Actually about 99 per cent. of the complaints were due to neglect of the burners. It was difficult to train the old gas-fitters to thoroughly clean burners when they went round. Last winter, after looking to this matter, and with no more pressure on the particular district, he did not have a single complaint. When neglect of a gas-engine led to trouble, the first thing a consumer would do would be to send to the gas-works and ask for more pressure to be put on; and if this was not done, he would continue to worry. He (the speaker) had had several cases in which he had sent men to look at the burner of an engine. After five minutes' work it was going again; and then there were no more complaints for another twelve months. Alderman Canning had referred to the question of plumbing. There was a plumbing class at Pontypridd. Eight or nine of his boys went there twice a week; and to encourage them, he gave prizes himself. At the end of the session, the Master sent him on the books, so that he could see what progress the pupils were making. He hoped something would be done to push on the same thing in connection with gas.

Mr. R. A. Browning (Neath) said the only remark he had to make was with reference to the gas profession, and the title of "engineer." They had lots of people who called themselves engineers but had no claim in any way to the name. He himself had been properly brought up as an engineer; and he had endeavoured to place his sons in the same position by giving them what he thought was the proper education. He put them in a first-class school, and then after that let them go through the whole course of engineering—through the workshops, drawing office, &c., right up. Then he gave them a thorough training in a large works. This was his idea. If they did this, they would raise the tone of the gas profession a good deal; and in his opinion it wanted raising. On the other hand, he supposed it was like other professions. They saw that people on the roads called themselves "surveyors." But he thought if they were careful to have a proper training for engineers, they would improve their position in every way.

Mr. A. W. Branson (Caerphilly) remarked that, to come to any practical conclusion with reference to the provision of better facilities for gas engineering training than already existed, it seemed to him that some committee or group of members should be appointed, and authorized to bring forward a plan of ways and means for the establishment of a school (say) at Cardiff. He knew several young fellows who were anxious to attend classes of this description; but they would have no opportunity of doing so unless the classes were established at Cardiff. It seemed to him that the number of students Alderman Canning had mentioned could be obtained in Cardiff; but without some committee to go into the matter, he was afraid the discussion would be to some extent wasted. He therefore proposed that a Sub-Committee be formed to try and arrange ways and means for these classes.

Mr. J. Parry (Cardiff) thought this was a step in the right direction, and seconded the resolution.

Mr. Branson did not know whether it would be in order; but he would suggest for the Sub-Committee Mr. Madden, Alderman Canning, and the President.

The President, however, thought it would be best to leave the question of the constitution of the Sub-Committee in the hands of the Council. Of course, the resolution was the right thing; and it was just what he was going to suggest himself. It was such a weighty question that this was the only way of dealing with it.

Mr. Branson said the resolution should be: "That we authorize the Council to form a Sub-Committee to go into the question of ways and means for the formation of these classes."

The proposition was put and carried unanimously.

The President said the subject had been so fully dealt with that it left him little to say. He heartily endorsed the view that they should pursue the matter to an end, by the appointment of a Committee.

Mr. Madden, replying on the discussion, remarked that Alderman Canning had taken up the portion of the subject that he had particularly left out of his paper—the question of the general training of an engineer. Of course, this was very important; but it was really secondary in his mind when reading the paper. It was not so much the training of the engineer he had in view as that of the outside department, the work of which was very difficult. He quite agreed with a proper elementary training before going into the profession; and Mr. Browning had taken the same course. If they could get a proper course in some centre where engineering pupils could go, they might be able to do the same for the outdoor department, subdividing them into fitting classes and what might be termed inspectors' classes. Of course, there would be evening classes for students after they had finished their work, so that they could combine technical training with practical work. Alderman Canning said they should make some allowance to pupils, &c., who were serving their time on the works. Possibly his Chairman, Dr. Taylor, would later say a few words on this important subject, because there was a certain amount of tribute due to the Cardiff Gas Company. They had taken the initiative for some time in the question of the educating of fitters. At Grangetown they had some boys in the engine-shops who were the sons of men on the works. There were four of them; and the terms of their working there were that they served their time (four or five years), but they must attend courses of technical classes for mechanical drawing, steam, and things like that. The Company allowed them to go about an hour earlier on the class-nights; and they were well repaid. He thanked the members for the discussion, which had brought out what he particularly wished—that something should be done for instituting classes throughout South Wales. How the idea should be carried out, of course, would be for the Sub-Committee to determine.

Surgeon-Colonel W. Taylor, M.D., J.P., said this question had engaged the attention of himself and his Board for some little time, and they had formed classes on their premises for their young pupils and employees. They endeavoured to get them educated at the technical schools of the city; but from some little feeling of jealousy on the part of the Unionists, they had to withdraw the young men from there, and teach them in their own works. He felt confident that the result would prove highly satisfactory; and he quite appreciated what Mr. Madden and Alderman Canning had said as to the formation of classes. As to the working of his Company, last year he and the Board adopted the co-partnership

principle which was established a good many years ago by the late Sir George Livesey in London. He went up with Mr. Clarry to see Mr. Charles Carpenter and ascertain some of the results of the working of the scheme; and he was so impressed that its adoption at Cardiff was decided upon. They invited the men to meet them at dinner in three sections; and he explained, so far as he could, the benefits to be derived from becoming co-partners. There were a few of the men at Grangetown not entirely favourable to the idea; and he took up a very firm position with them. He told Mr. Madden if he had any trouble with the men to give them their proper notice and let them leave. They got rid of two the first week, and four the second week—making six in all. Some of the men at the Bute Terrace end, too, were not entirely favourable. One was the President of the local branch of the Gas-Workers' Union, and another the Secretary. About thirty were a little troublesome. When they were not invited with the first section to dinner, they asked why, and were told that as Unionists the Company did not think them fitted to come in as co-partners. Within two days, each one of them had resigned his position in the Union; and they went then to the second dinner. He could assure the members that the men who were at this time a little disagreeable had been the Company's warmest supporters ever after. Since the establishment of the scheme, there had been entire loyalty among the men, from one end to the other. The men were saving in every possible way. Things that were formerly thrown away and wasted were now carefully kept. He was satisfied; and the men would be satisfied, when they came to the second year's earnings. The Company were doing all they could to encourage and unite with their men. They had a very steady body of employees. They carried off prizes at the miniature rifle ranges; and they had also been victorious at baseball. A mess-room and bath-rooms were being put up at Grangetown to add to their comfort. The Directors had taken a piece of ground 4 acres in extent adjoining the works, on which the men could play at anything they pleased; and this was much appreciated. He felt convinced that the more they brought themselves in contact with their men, the greater would be the appreciation of them by the employees. As a Gas Company they were progressing very favourably in Cardiff. The manufacture of gas was a progressive science; and if they wanted to keep pace with the times, they must scrap a good deal of old material and get up to date. He travelled over the country with Mr. Clarry to see the newest plant. There were discussions on horizontal, inclined, and vertical retorts; and there was no knowing which was going to be the best. Engineers were now going away from small charges in the retorts to charges of 10 and 10½ cwt., and from six-hour to eight-hour charges—and with very good results. They obtained a better quality of gas and coke. He did not know whether they had yet arrived at the largest retorts. In the Cardiff district it was found that people were using 6¼ ton charges of coal for manufacturing coke; and from these they obtained 5 tons of first-class coke, and also large quantities of tar. The gas they used for engines or other purposes, so that it was not wasted. In fact, he thought, though he was not certain, that they supplied gas to a neighbouring gas-works. Returning to Mr. Madden's paper, he was glad the Association had determined to appoint a Committee to inquire into the question of classes. It was a subject that must engage the attention of engineers. Everything was scientific now; and rule-of-thumb was nowhere. Complaints with regard to bad gas and defective pressure were due entirely to the consumers. If they did not look after the burners, they must expect to suffer.

Colonel H. Oakden Fisher, J.P., the Deputy-Chairman of the Company, remarked that he had really nothing to add to what had been said. The competition they had to put up with now was exceedingly severe. It was of no use for gas people to act on the defensive alone. They must be able to act on the offensive. They must get at the enemy, and beat them in every way they possibly could.

Water sterilization by means of the ultra-violet rays has been under investigation long enough now, "Engineering Record" says, to enable some general idea of its efficacy to be formed. The bactericidal action of these rays has long been known; and in treating water the experiments have generally been made by immersing some form of mercury vapour lamp in the liquid. The experiments of M. Victor Henri have shown that the voltage of the lamp and the distance from it to the place whence samples are drawn, have a marked effect on the result. For example, a Cooper-Hewitt lamp of 110 volts was immersed in water containing *B. coli*. The sterilization required an exposure of 300 seconds at a distance of 24 inches, of 180 seconds at 16 inches, of 20 seconds at 8 inches, and of 4 seconds at 4 inches. When this lamp was replaced by one of 228 volts, the time of exposure necessary to secure sterilization at a distance of 24 inches was 30 seconds, at 16 inches 20 seconds, at 10 inches 4 seconds, and at 4 inches less than 1 second. These results were obtained with comparatively clear water. Unfortunately, it has been found that clearness seems to be necessary for satisfactory sterilization in this way; for a turbid liquid can only be sterilized by passing it in very thin layers close to the source of the ultra-violet rays. It is understood that the results obtained are so encouraging that the Westinghouse Company of France are engaged in developing an apparatus for sterilizing small quantities of water, which can be substituted for the ordinary domestic filter in houses where the electric current is available.

ILLUMINATION REQUIREMENTS IN THE LIGHTING OF STREETS.

The "Journal of the Franklin Institute" for the current month contains a paper on the above-named subject, submitted at a recent meeting of the Institute by Mr. Arthur J. Sweet, Engineer of the Holophane Company, of Newark (O.). The following are extracts from the communication.

The problem of illumination is a complex "molecular" one rather than a simple "atomic" one. To be adequately studied, it must be split up into its constituent subordinate problems, and these considered separately and in their relations to each other. Among these problems, intensity and distribution are linked together as quantity factors. Distribution is simply the problem of relative intensities—of the proportion of intensities at different points. Diffusion and colour value are grouped together as quality factors, though each is, of course, independent of the other. Total light flux in the field of vision and shadow contrasts are two closely related yet separate factors affecting the efficiency of the eye, the receiving apparatus. Subordinate to the factor of total light flux in the field of vision, but of the most vital importance, is the factor of the intrinsic brilliancy of light-giving or light-reflecting objects in the field of vision.

The relation of the above analysis to the problems of street illumination becomes at once apparent. There are two results to be achieved in adequate street illumination which are both of such paramount importance that it is properly a matter for individual opinion as to which should be ranked first. These are the avoidance of glare effect and the obtaining of an approximately uniform degree of illumination at all points along the course of the street, with higher intensities at the street corners. One of these two results can only be obtained by the correct solution of the allied problems of intrinsic brilliancy, total light flux, and shadow contrasts; the other by the correct solution of the problem of distribution. Let us take up separately, in preliminary fashion, each of the results sought, and define it a little more exactly.

Glare effect results whenever, throughout any infinitesimal period of time, an amount of light continues to fall upon the actively visualizing portion of the retina of the eye sufficient in quantity to cause chemical changes more rapidly than the regenerative functions of the eye can keep pace with. Thus when an eye which has been exposed for some time to conditions of dark, with resultant pupillary expansion, is suddenly exposed to even a moderate light, glare effect results. An excessive amount of light reaches the retina through the expanded pupil, and the regenerative functions cannot keep pace with the chemical changes induced. Rapidly, however, the pupil contracts; the regenerative functions regain their normal control; and the glare effect passes away. If now the eye be exposed to still greater intensity of light, beyond the very limited capacity of pupillary contraction to compensate for, or if an even moderately bright light source is introduced near the centre of the field of vision, glare effect is again experienced; and this, after a brief period, reaches a certain state of equilibrium characterized by a quite definite reduction in efficiency of vision, which decrease thereafter increases in magnitude only rather slowly. We may, therefore, for convenience, designate a glare condition as casual, when it results from the inability of the pupil to adjust itself instantly to a changed condition of light intensity, and as fundamental when it results from a light intensity exceeding the contractive power of the pupil to compensate for, or when it results from a light source near the centre of the field of vision. The presence of strong shadow contrasts tends to produce a casual condition of glare. Objectionably-located shadow contrasts can only be avoided by the proper placement of the light sources; while the intensity of the shadow contrast can be decreased by using smaller lights placed closer together. The problem of shadow contrasts, while of considerable importance, is, however, one that must be solved for each individual case.

Brilliant high-power light sources in the field of vision—the usual practice in contemporary street lighting—produce a fundamental condition of glare, with resultant heavy decrease in efficiency of vision, with probably also a permanently injurious effect on the faculty of vision. This fundamental condition of glare arises from the intrinsic brilliancy and total light flux of the light units employed, and can only be avoided by the proper limitation of these. The study of the relations existing between intrinsic brilliancy and total light flux on the one hand, and glare effect on the other, becomes, therefore, one of the two chief purposes of an analysis of the illumination requirements of street lighting. The end sought should be to eliminate glare effect, or at least its reduction to such a permissible minimum as will not seriously decrease efficiency of vision or be sufficient to produce eye discomfort.

The derivation of the polar curves of light distribution which will give the proper relative intensity of illumination for points along the course of the street, is the second of the two chief purposes of an analysis of illumination requirements in street lighting. Here the end sought is the uniform illumination of all points along the course of the street. There is no reason, either in scientific fact or in common sense, why one point along the course of the street should be more brightly lighted than another, with the exception of street intersections and similar crossings.

The present almost universal condition of brighter illumination under and near the light unit is simply a concession to our present ignorance of how to obtain something better. There is, on the other hand, abundant reason to condemn this spot-lighting practice. At street intersections and similar crossings brighter illumination is needed, for obvious reasons. This should be of from four to eight times the intensity of the illumination along the main course of the street. Such brighter illumination is properly provided for by employing from four to eight light units, each having the same light distribution as the units used along the course of the street, or by one or two units of similar light distribution and larger size. The street intersection, therefore, presents no complication to our problem, and its proper treatment becomes merely a matter for adequate consideration at the time of installation.

The statement is often heard that in street lighting absolute uniformity of illumination is not required, and is of no particular importance. Taken in a very strict sense, this statement contains much truth. But it has been so very generally used as a refuge for loose thinking, by the scientific man as well as the layman, that it is worth a moment's careful consideration. It is true that a variation of two to one, taking the minimum intensity as unity, is only barely noticeable, and is entirely permissible. But let us invariably ask our friend who says uniformity is not required what numerical value he will assign as the ratio of maximum to minimum intensity. If he gives us four to one, or a less ratio, we will agree with him, and ask him to oblige us by keeping this ratio in mind in our further discussion. If he gives us eight to one or twenty to one, or some such figure, we will disagree with him; and we will propose a hopeless task to him if we ask him to justify, by properly established scientific fact, such a ratio as permissible from any other standpoint than that of our possible inability to obtain greater uniformity. At the same time, we may profitably point out to him that the ratio in present practice most frequently falls between 100 and 500 to one.

Another much-mooted question concerns the way in which illumination should be measured—whether horizontally or perpendicular to the ray of light. The latter method has been largely adopted in American practice, chiefly through the influence of the commercial interests concerned, who desire to make the minimum value look as large as possible. There is little to be said in favour of it, except that it may help us to remain in a "Fool's Paradise" concerning the satisfactoriness of the illumination we are getting. It is true that in street service illumination is desired at different times on almost every conceivable plane. But the best single measure of how well these many diverse requirements are met is the intensity of illumination on the horizontal plane. This, therefore, which is the accepted reference plane in interior lighting, is the logical and most satisfactory basis for street illumination measurements. The ideal to be aimed at in all styles of street lighting, as far as intensity is concerned, is uniform horizontal illumination. On this basis, we can proceed to derive the ideal curves of light distribution. These once derived, we may properly take into account the fact that absolute uniformity is not of importance; and we will only ask that the actual light distribution sought for as a practical ideal should show no greater variation from our theoretical ideal than four to one in the ratio of maximum positive variation to maximum negative variation as read in percentage values of the theoretical curve along the corresponding angles.

The nature of a street makes most natural a placement of light units as a line of single units extending along the street; the units being hung over the centre of the roadway or located alternately on either side. For all practical purposes, these two cases can be treated as one; the separation of adjacent units being taken as the straight line distance between the units, and the distribution curve derived being the correct distribution in a vertical plane passing through the unit concerned as well as the adjacent unit. There are an infinite number of light distributions which will give uniform illumination from a line of light units along a line extending immediately under those units. Other considerations than the obtaining of uniformity must, therefore, serve to enable us to select the most desirable distribution curve. Two such considerations are of importance and may be applied with especial propriety. First, we should seek such a distribution as will be best suited for actual practical attainment. This consideration is of the more importance because, as we shall find, even when maximum weight is given to it, our derived curve will present considerable, though by no means insurmountable, difficulties of practical realization. Secondly, the illumination at any point should be derived from a source as near as possible, in order to avoid both excessively long shadows and the glare effect which results from the high candle power made necessary by illumination at great distances.

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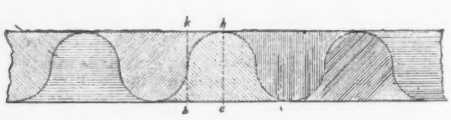


Fig. 1.

The curve which best meets the conditions imposed is such as is shown in fig. 1. It is formed by two circle quadrants combined as shown. The corresponding distribution curve shows a low maximum which occurs at a slightly smaller angle than that subtended by half the separation of the units. It is also as well adaptable to practical realization as any curve obtainable. We have, therefore, obtained the ideal illumination curve from which the desired distribution curve can be easily derived. Our next task is to put these results into such form as to be easily applicable to practical conditions. The relation between any desired illumination results and the distribution required to produce the results depends, in the type of problem under consideration, on: (*a*) The distance between adjacent units; and (*b*) the height of the light unit above the street. That is to say, for any given separation of units and height above the street, we can easily calculate the distribution curve which will produce the desired illumination result.

It is obvious that any given distribution curve will show the same proportionate illumination results so long as the relation between the separation of units and the height above the street is kept constant; since so long as this relation remains constant the angular relations are unchanged. We can combine, therefore, the factors (*a*) and (*b*), and say that the distribution required to produce any given illumination result depends upon the relation between them. Let us call this relation M. Then—

$$M = \frac{\text{distance between adjacent light units}}{\text{height of the light unit above the street}}$$

For any value of M there is a given distribution curve which will produce the desired illumination result.

Present-day street lighting practice shows a wide variation in the value of M. The writer has recently addressed the managements of the central stations and gas interests in most of the large cities of America, and through their kind co-operation obtained an official statement in each case as to average, maximum, and minimum separations, and mounting height above the street. The values of M thus obtained (based upon average separations) vary from 5 to 31. The smaller cities would probably show, in general, a higher value than the large ones. All things considered, M = 15 can probably be taken as the most representative value of present-day American practice, with a marked tendency towards smaller values in the more recent installations.

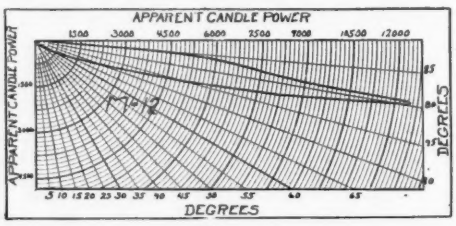


Fig. 2.

Fig. 2 shows the distribution curve required to produce uniform illumination when M = 12. Here we are at once brought face to face with the nature of the problem that confronts us. It needs no specialist to point out that such a curve as shown is impracticable for actual realization, and would be extremely undesirable, even if it were practical to obtain it, on account of the excessive glare effect resulting from the very high candle power maximum at a large angle. It will be observed that the maximum candle power is about 130 times the minimum, or zero degree, candle power. The diagram serves one most excellent purpose. It shows concisely and beyond argument that, with a value M = 12 or greater, any attempt at adequate street lighting is absurd. If ignorance and false economy compel an installation value of M = 12 or greater, the pretence of obtaining "street illumination" should frankly be abandoned. Instead, the lights should be installed on the basis of a system of street markers, and located where they will best serve in this capacity. In such case, maximum usefulness will be obtained when the candle-power values at the different angles are as close as possible to, yet not exceeding, the limits imposed by the avoidance of glare effect.

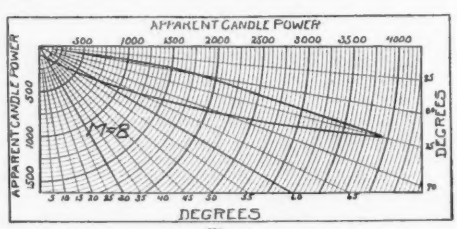


Fig. 3.

Fig. 3 shows the required distribution curve for uniform illumination when M = 8. Here we are beginning to approach a form of curve practical for actual attainment; but the still very high candle-power maximum is prohibited by the limitations imposed by avoidance of glare effect. Figs. 4 and 5 give the required distribution curves when M = 6 and M = 4 respectively. These distributions are entirely practicable for actual attainment. For instance, referring to fig. 6, the full-line curve shows the actual distribution of one make of arc lamp to-day on the market; while the dotted curve is the ideal curve for M = 4. It will be seen

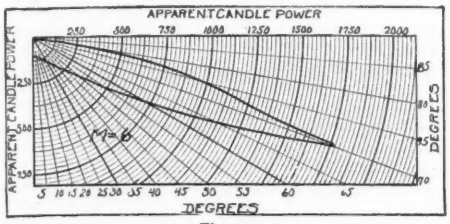


Fig. 4.

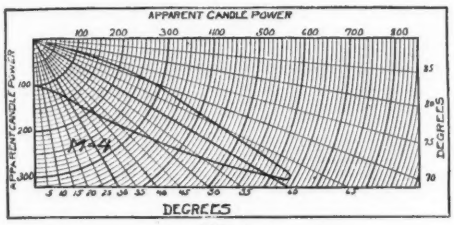


Fig. 5.

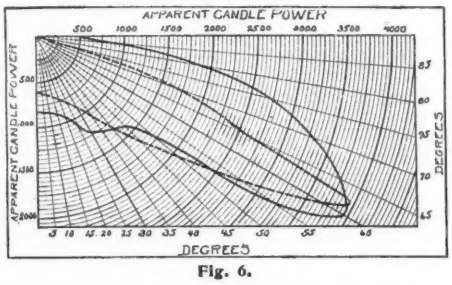


Fig. 6.

that the agreement of the two curves is admirable up to an angle of about 62°. The curves M = 4 and M = 6 would also be comparatively easy of attainment with the incandescent lamp or with the inverted gas-mantle. This is of special importance, since with these lower values of M such smaller units give amply sufficient intensity of illumination except in those business centres where night traffic is considerable. Smaller values for M than 4 would obviously fulfil all the conditions imposed by the requirements of good illumination. It will be shown later, by our study of glare effect, that a value M = 3 is necessary to obtain the best results whenever, on account of the shaded conditions of the street or other considerations, it is desirable to mount the units at a height of 15 feet or less above the roadway. Closer spacing of units than M = 3 entails a corresponding increase in installation and maintenance costs, and is not demanded by the illumination limitations of the problem.

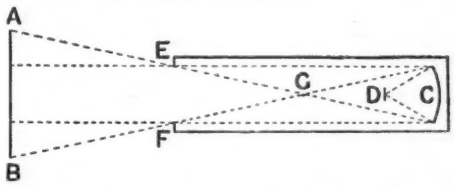
Thus far in our discussion we have considered distribution only as referred to the vertical plane passing through the light unit and its adjacent unit. We will now consider the vertical plane perpendicular to the street line. In those rare instances where the width of the street from property line to property line is greater than the separation of adjacent units, the ideal distribution in this latter plane is similar, for the lesser angles, to the distribution required by the existing value of M. It continues, however, to a higher maximum, turning and receding rapidly to zero above the angle subtended by the distance from the light unit to the more distant property line. When the street width is not greater than the separation nor less than three-fourths of the separation, the distribution in the plane across the street should be approximately the same as in the plane through the light units. When the street width is less than three-fourths of the separation, the distribution in the plane across the street is similar, for the lesser angles, to the distribution required by the existing value of M. But in this case the maximum is lower; the curve turning and receding rapidly to zero above the angle subtended by the more distant property line. In oblique planes, the distribution values should be proportionately intermediate between the values in the two planes already considered. It is proper to note that the importance of obtaining correct distribution results in the plane perpendicular to the course of the street, and in adjacent oblique planes is rather one of obtaining maximum efficiency than of guarding against unsatisfactory illumination results.

Summing up the previous paragraphs, the requirements of good street illumination, as determined by distribution considerations, are as follows: Uniform horizontal illumination is the ideal to be aimed at, and the approximation to this ideal in actual practice to within a four-to-one ratio of maximum to minimum may be taken as sufficiently close for all practical purposes. The most desirable type of curve for the illumination delivered by the individual unit is such as is shown in fig. 1. When the light sources are separated by a distance greater than six times the mounting height above the street, it becomes impracticable to design a unit giving such light distribution as would be required for a sufficiently close approximation to uniform illumination. When the light sources are separated by twelve times the mounting height or greater, the pretence of adequate street illumination becomes an absurdity; and when ignorance of the factors involved has led to such separations, the best results can be attained by abandoning all pretence of street illumination, and by installing the light units as a system of street markers. Separations of three to six times the mounting height are required by distribution considerations.

(To be continued.)

A "FIXED FOCUS" RADIATION PYROMETER.

It is generally acknowledged that the "total radiation" pyrometer is preferable to the purely "optical" one for industrial work; but the instruments of this class hitherto made have needed accurate focussing in use in order to ensure their efficiency. This is especially the case when they have been put into unskilled hands. Recognizing this defect, Mr. Charles E. Foster devised an improved instrument, which is described and illustrated in the current number of the "Journal of the Franklin Institute," from which the following particulars are taken.



The casing has at one end an aperture E F, and at the opposite end is a gilded concave mirror C. One of a pair of conjugate foci of the mirror is at the aperture, while the other is on the sensitive device D. Therefore there will be thrown on D a focussed image of the aperture. Since the relative positions of these three essential parts are fixed, no focussing is needed in use. For this reason the instrument has been called the "Fixed Focus Pyrometer." The only condition that must be satisfied is that the aperture, as seen from every point of the mirror surface, must be filled by the hot body under test. This condition is satisfied if the hot body coincides with, or overlaps, any section of the cone G A B, or any extension thereof.

In the instrument exhibited on the occasion of the meeting of the Franklin Institute at which Mr. Foster described it, the position of the apex G is marked by the centre ring. The directions for use are that the distance from the hot body to the centre ring must not exceed a certain constant multiple of the smallest dimension of the hot body. In the case here the multiple is ten—that is to say, with a hot body whose diameter or other smallest dimension is 6 inches, the working distance, as measured from its surface to the centre ring, must not be more than 60 inches. Any smaller working distance will not alter the reading, provided the body is uniformly heated. The only result of bringing the hot body A B closer would be that its outer edges would be out of the measurement; consequently the user is not called upon for accurate judgment or measurement of distance. For work on extremely high temperatures, the proportions of the cone G A B can be altered so as to allow working at greater distances.

In the example shown, the sensitive device is a very small thermocouple. The heating of the junction where the two elements are joined together by the focussed radiation generates an electromotive force; and this, or rather the resulting current, is read on a suitable calibrated milliameter. The calibration is made direct reading in temperature. Without involving inconvenient dimensions, the electromotive force developed at 2400° Fahr. exceeds that which would be given by a Le Chatelier thermocouple inserted directly into a furnace at this temperature. Since the thermocouple in the receiving-tube is of low and constant resistance, the rest of the circuit may also be of low resistance. This allows the use of an indicating instrument of very robust construction. Another advantage of this type of instrument is that the mirror is well protected from dust and fumes, because it is situated at the bottom of a long closed tube. As indicating the order of accuracy to be expected, a certificate issued by the Bureau of Standards, Washington, may be quoted. The instrument tested was one of the first of this type made, and no unusual care was taken in its calibration. The results were given to an accuracy of the nearest 20° Fahr.; and at only two points at the top of the scale were there any corrections greater than this limit of test accuracy. In all cases the corrections were less than 2 per cent. of the temperature reading.

The "Bulletin de la Société d'Encouragement pour l'Industrie Nationale" for January contains two reports by M. Moreau on two forms of road-tarring appliances, due to MM. J. Lassailly and J. Vinsonneau respectively. The tar has to be extracted from the barrels, warmed to a temperature sufficient to reduce its viscosity and remove water, and applied to the road as uniformly and as rapidly as possible. In the first apparatus, all these operations are carried out by steam, and require a minimum of skilled control. The Vinsonneau apparatus warms the tar to 80° C. by a thermosiphon heated by a petrol burner, and distributes it by means of compressed air. Superficial tarring by either process costs 0·7d. to 0·8d. per square yard treated.

HIGH-PRESSURE GAS DISTRIBUTION PROBLEMS.

By L. H. Johnson, of Aurora (Ills.).

[A Paper prepared for the Illinois Gas Association.]

With the introduction of high-pressure gas distribution, there arose many initial problems, the solution of which assured the success of this system. With its adoption, however, there arose minor problems of construction and operation, which must be met by the distribution engineer in order to obtain entirely satisfactory results. These may arise from chemical, physical, or from mechanical causes. It is the purpose of this paper to direct attention to certain of the problems encountered by the Western United Gas and Electric Company in their high-pressure system, some of which it is believed have been successfully conquered, and others which are yet to be solved, in the hope that a discussion of some of these questions may be of interest and assistance to gas engineers who are engaged in, or are contemplating, high-pressure gas distribution.

Perhaps it would be well to give first a brief description of the Company's system. They supply gas to thirty cities and towns in Will, Du Page, Kane, Cook, and M'Henry counties. The gas is delivered from four plants, located at Elgin, Joliet, Aurora, and La Grange. All the towns are connected by a high-pressure pipe-line; and the four plants pump into this line at pressures ranging from 40 to 60 lbs. The Aurora and Elgin plants send out a mixed gas, and the Joliet and La Grange plants "straight" coal gas. In the four cities in which plants are located, we distribute under low pressure direct from the holder; reinforcing the outlying districts from our pipe-lines by the use of district governors. Five of the other towns have low-pressure distribution systems, fed from the pipe-line through 4-inch district governors. In the remainder of the towns, gas is distributed under high pressure direct to consumers; Reynolds combination governors being used at each house.

The first problem we will consider is one which we have not yet solved—that of stoppages in main and service pipes. It is, strictly speaking, a manufacturing problem; but it must be considered by distribution men on account of its effects. The problem does not consist in the remedy, but in its prevention. As a general rule, it is comparatively easy to blow out any stoppage in a pipe where 40 or 50 lbs. of pressure is available; but this work always entails the cost of labour. There is also the constant danger of shutting off a consumer or consumers; so that satisfactory service can be obtained only through prevention. In our 8-inch pipe-line between Joliet and Aurora, we have encountered considerable trouble from a black powder which is deposited in the pipe-line itself, and in smaller mains and services branching from it. This can always be blown out by opening the ends of mains or services where it is giving trouble. There seems to be a danger, however, of the powder working its way into the meters and seriously affecting them. It also prevents satisfactory results from the gate-valves in the pipe-line. An analysis of the powder shows it to contain 40 per cent. of volatile and 60 per cent. of non-volatile matter; the former appearing to be made up of coal-tar pitch or some substance of similar nature. The non-volatile part contains 94 per cent. of iron oxide; the remainder consisting of carbon, part of which is a decomposition product formed during the determination of the volatile matter, though there is, without doubt, a small portion of free carbon in the original powder.

Last fall we had a more serious stoppage in the 4-inch pipe-line between Elgin and St. Charles, caused by a substance composed principally of the same compounds in different proportions. It had the consistency of pitch, and was formed in sufficient quantity almost to stop up the pipe-line. In endeavouring to clear out the pipe, we first tried to find a cheap solvent for the substance; but it was insoluble in hot water, benzine, gasoline, naphtha, kerosene, and alcohol. We found that it could be materially softened by steaming; so we hired a traction boiler, and steamed the main in sections of approximately 500 feet, disconnecting at the sleeves. When the substance was softened, we connected up the main at one end, and blew it out with gas. By this process we were able to get the pipe clear again. This deposit had a specific gravity of 1·38, and a melting-point of 70° C. (158° Fahr.). It had an ash of 16·4 per cent., which contained 90 per cent. of iron oxide. In its composition and properties the organic portion resembled pitch, which may have been formed by a polymerization of some of the constituents of the gas, and separated by the cooling it undergoes in passing through the pipes; or it may have been already formed, and may exist as vapour on entering the pipes, where it may have been deposited with the iron oxide, and as this settled the particles of iron oxide formed nuclei round which the pitchy matter deposits.

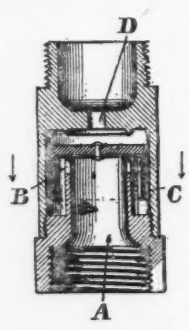
Near our La Grange plant, we have had but one instance of stoppage. This was similar to that found near the Elgin plant. Around Aurora we have had no trouble. Elgin is the only town in which we have encountered any of these deposits in our low-pressure mains. This one case, however, would seem to preclude any theory that high pressure has any bearing on the formation of these substances; but the fact remains that it has more serious results in high-pressure systems than in those in which gas is distributed under low pressure.

Having introduced the subject of deposits in high-pressure mains, I will pass on to one of its most troublesome results—viz., the effects on the efficiency of the valves. It is, of course, obvious that with any foreign substance in the mains there is always the liability of some of this substance lodging under the gate of a valve, thereby rendering it ineffective. Because of this difficulty, we have experimented with globe valves. The question of their throttling effect was brought up; and, in order to determine how much reduction in pressure would be caused by one of these valves, we tested a 2-inch valve passing different amounts of gas at initial pressures of 10, 15, 20, 25, and 30 lbs. The quantity of gas passed ranged from 3900 to 11,700 cubic feet per hour. The greatest drop obtained was naturally found under the most extreme conditions—11,700 cubic feet per hour, with an initial pressure of 10 lbs. This amounted to 8 inches of water—an amount practically negligible when we are considering high-pressure work. We have had fairly satisfactory results with these valves, as far as shutting off the gas is concerned; but they have the disadvantage of being harder to pack than a gate-valve when there is pressure on the line.

The most important problem confronting gas engineers is that of safeguarding the consumers from any possible accident to life or property. In high-pressure distribution this is especially necessary; and with this end in view, the practice of installing safety-vents originated. This installation in itself, however, does not ensure safety. Experience has shown that it is necessary to have them inspected frequently, in order to see that they are not stopped up by ice, dirt, or by the consumer. Vent-pipes do not necessarily protect against accidents; and it is to this fact that I wish to call particular attention.

As previously remarked, we are using Reynolds combination governors in houses which we supply directly by high pressure. We have had two cases of explosions of meters caused by the diaphragms of the governors breaking. Fortunately both these cases occurred in summer, when there were no furnace fires in the cellars and the windows were open, so that it was possible to get the gas shut off before it became ignited. It can be readily seen, however, that very serious damage might result from an accident of this kind. An investigation of the governors revealed the fact that the diaphragm had split at the end of the casting. The rush of gas escaping through the inlet to the seal had sucked the leather across the hole, thus shutting it off completely. Above the top of the diaphragm there is a small air-vent, through which part of the gas escapes into the vent-pipe; but this is not sufficiently large to take the full quantity of gas. Later experiments have shown that in a case of this kind, with an initial pressure of 40 lbs., it is possible for the pressure on the meter to go as high as 25 lbs., which is far beyond the limits of safety.

The first remedy which we tried for this defect was to have the lower halves of the governors cast with two radial ridges, about ¼ inch high, one on either side of the opening; and it was hoped these would prevent the leather from closing off the hole. But they proved absolutely ineffectual, as the leather was sucked down between the ridges, and the hole closed off as before. Mr. C. W. Lockwood, of the De Kalb County (Ills.) Gas Company, then devised a vertical check-valve which we have adopted to prevent a repetition of the accidents. This valve, which is shown in the accompanying diagram, is placed between the lock cock and the regulator. Its action is as follows: During ordinary consumption, the gas travels up through the passage-way A, out through $\frac{3}{16}$-inch holes B down beneath the bottom edge of the brass cap C, and through the opening D. A sudden rush of gas, such as is occasioned by the bursting of a diaphragm, throws the cap C, which has a leather seat, upwards, holding it against a valve-seat, and sealing off the opening D. We are installing these check-valves on all services which carry our full line pressure. Wherever it is possible, we are putting in reducing regulators on the feed lines into towns, reducing the pressure to 10 lbs. Thus we are enabled to transmit gas under 40 to 50 lbs. pressure, while we distribute under pressure low enough to ensure against accidents from exploding meters. This method of distribution has also the further recommendation of tending to reduce leakage. It seems to be ideal in every regard but one—it reduces the storage capacity of the pipe-line.



A question which frequently arises in connection with high-pressure distribution is as to the smallest main it is advisable to lay. In deciding it, leakage should be considered. If leakage in mains is proportional to their circumference, it would seem that we should lay as small ones as possible. Another point to be taken into consideration is connecting up the services. Mains of 1 inch size or smaller can be cut and tees inserted; but this entails the cost of notifying other consumers on this main, and shutting off the gas. The smallest service clamp which will give satisfactory results is 1¼ inches. As the difference in cost between 1¼, 1½, and 1 inch pipe is slight, we adopt 1½-inch as our smallest size.

One practice in high-pressure distribution that will be found in all extremes in different gas companies is the use of patent couplings for expansion joints. Many of the pipe-lines for natural gas have these couplings at every joint; and some companies distributing manufactured gas under high pressure have adopted the practice. Many companies place the couplings at various intervals; while some do not use any—making no allowance

whatever for contraction or expansion. In the past, the Western United Gas and Electric Company made a practice of placing expansion joints at intervals of 500 feet. Our experience, however, has been that in many cases there are no indications that these couplings have acted in the capacity intended, probably due to the fact that the friction of the ground prevented any noticeable movement of the pipe. In places where there has been any appreciable movement, we have encountered trouble from leaks, caused either by the rubber gaskets wearing or by their rolling. In the instances where no contraction or expansion is found, we have experienced no difficulty from the pipes pulling apart; and it is a question whether it is advisable to use this type of coupling, except in cases of constructional necessity. Is this not an opportunity to reduce some of the ever-present leakage?

MUNICIPAL & COUNTY ENGINEERS ASSOCIATION

A Home Counties District Meeting of the Association was held at the Town Hall, Chiswick, last month. Mr. W. Nisbet Blair, M.Inst.C.E., the President, occupied the chair.

Public Lighting of Chiswick.

In a paper on Chiswick, Mr. E. Willis, the Engineer to the District Council, made the following reference to the street lighting of the district: The street lighting is effected by the Brentford Gas Company; the total number of lamps existing at the end of March, 1910, being 878—made up of ten 4-cubic feet flat-flame burners, 843 3½-cubic feet incandescent burners, one 7-cubic feet incandescent burner, and 24 10-cubic feet incandescent burners. Since last summer, the lighting of the public lamps has been effected by the Rostin automatic pressure apparatus; and though at times this system has appeared to be efficient, the author regrets he cannot express entire satisfaction with it. The principal difficulty, in his opinion, appears to arise through the divergence in the size of mains, which, even with power plant, does not allow for a wave of uniform pressure throughout the whole district. He is, however, satisfied that the Engineer of the Brentford Gas Company has made every effort to limit these defects, and has recently installed new machinery for increasing the pressure to such an extent as will practically guarantee the lighting of all lamps, including those upon the extremities of the district.

Town Gas for Sewage Pumping.

Mr. J. H. Abbott, the Engineer of the Sewage Disposal Works, said the works were originally opened in 1879; and since then practically no alterations of importance were made until during the past five years, when the additions were somewhat extensive. They include the change from pumping by steam to pumping by gas power, the installation of a destructor, enlargement of the press house, and the addition of extra precipitation tanks and filter-beds now in course of construction. The total pumping capacity is 16 million gallons per day, and consists of two sets of 10-inch centrifugal pumps directly coupled to gas-engines of 20 B.H.P., and two sets of 15-inch centrifugal pumps directly coupled to gas-engines of 36 B.H.P. The total lift is 20 feet; and one of the 10-inch pumps can easily pump the dry-weather sewage flow in seventeen hours. Town gas is used throughout; and the engines are started by means of compressed air. In the engine-room there are also two four-cylinder single-stage air-compressors directly coupled to gas-engines of 16 B.H.P., each capable of delivering 50 cubic feet of free air per minute compressed to 100 lbs. per square inch. These supply compressed air for the sludge presses; and the engines are also utilized for driving shafting for the lime mixers, circulating water pump, and hydraulic power pump.

Mr. Phipps, referring to Mr. Abbott's paper, remarked that it seemed rather strange to find, a dust destructor having been installed, that the regenerator steam plant had been abandoned in favour of pumping by gas, and that the pumping was by town gas, and not suction gas. He would like to know the reason for this—whether the pumping by town gas proved to be cheaper than pumping by steam, and whether, if new steam plant had been put in, the cost by town gas would still be cheaper. He would have thought suction gas would have been used; but probably the town gas in Chiswick was very cheap.

Mr. Abbott, in reply, said the substitution of gas for steam engines had resulted in a saving of £600 a year. They might have used suction gas at a small saving; but the constant load was only a few horse power, and it was a great advantage, in a flat district such as Chiswick, to have a reserve power like the town gas, which could be turned on any moment when required.

Barnes, Barn Elms, and Hammersmith Stations of the Metropolitan Water Board.

Mr. H. F. Rutter described the Barnes, Barn Elms, and Hammersmith Stations of the Metropolitan Water Board, which the members visited during the day. He pointed out that this group of stations forms only a small part of the Metropolitan Water Board system. It comprises subsiding reservoirs, filters, and a large pumping-station; the whole plant being capable of supplying from 25 to 35 million gallons of water per diem. The water from these stations forms part of the supply needed for the western district of the Board, the population of which is about 1,535,391; the average daily supply being some 55,775,110 gallons, or 36·33 gallons per head. About 25 per cent. is supplied by meter.

The latter portion of the paper consisted of particulars with regard to new plant designed and constructed by the author at the Hammersmith Pumping-Station. The new engine-house is 112 feet by 42 feet. Its foundations are carried down to the London clay. The brickwork up to the ground level is of Fletton bricks set in cement; and the superstructure is of Fletton brickwork in blue lias lime, faced on the outside with red Bracknell bricks and Portland stone dressings. On the inside, the walls are lined with glazed bricks with a tiled dado. The working floor is composed of concrete slabs reinforced with expanded metal, resting on rolled joists, and covered with red flooring tiles. As the basement floor is below the permanent level of the water in the ground, the building has been made watertight by a double layer of asphalt laid over the whole area of the foundation, and brought up to ground level outside the walls as a vertical damp course. A 12-ton traveller spans the house, and is approached by ladders leading to a gallery which extends the whole length of the east side of the house. There is a trussed roof cleaded with Canadian maple, lighted by a monitor glazed with wired glass.

The engines in this house are known as Nos. 14 and 15. They are identical in every respect except as to the size of the pump plungers. They are triple expansion inverted engines of the marine type, each with three double-acting pumps; the pumps being placed directly beneath the cylinders. Four side rods which straddle the crank-shaft connect each piston crosshead with each pump crosshead.

The cylinders are respectively 23½ inches, 35⅜ inches, and 60½ inches in diameter, by 4-feet stroke. The high and intermediate cylinders are jacketed with full-pressure steam and the low-pressure cylinder with steam reduced to 50 lbs. pressure. The cylinders are supported at the back on cast-iron guide-frames, and in front by polished steel columns, each passing through, and secured to, a bracket cast on the cylinder casings. The guide-frames and columns are in turn supported by a cast-iron bed-plate bolted up in sections, on which also the bearings of the crank-shaft are cast. The connecting rods are 2½ times the length of the stroke—viz., 10 feet long. There are two fly-wheels, each 15 feet in diameter, to each engine; and these are placed outside the bed-plate. Thus there are no overhung cranks. The crank-shafts are of forged steel, built up of three identical units coupled with taper bolts; the journals being 13½ inches in diameter. A barring engine is fixed for starting each engine, and has an automatic throw-out, which disengages the gearing as the engine gathers way.

The steam-valves are drop valves with trip gear operated by a horizontal lay shaft, which extends along the front of the cylinders, and is rotated by bevel-gearing from a vertical spindle worked by spiral gear off the crank-shaft. The valves themselves are of cast iron working on cast-iron seats driven into boxes cast in the cylinder heads. These valves were adopted on account of the comparatively high temperature to which they will be exposed. The steam pressure is 150 lbs., and the saturation temperature is increased by about 120° Fahr. of superheat. A reheater is provided between the high and intermediate and between the intermediate and low-pressure cylinders. These are heated with full-pressure steam. The cylinders and reheaters are coated with 3½ inches of carbonate of magnesia, and lagged with blue steel planished sheets secured with polished steel bands.

A governor is provided which, in case of a sudden increase of velocity due to a burst main, would immediately cut off steam to the high-pressure cylinder, and also open a valve to destroy the vacuum in the condenser. Gravity lubrication is provided throughout. The oil from a tank on the upper deck descends to each bearing through a system of oil-pipes. The flow is restricted only to the amount that each bearing can take; and the oil, after passing the bearings, is led by drain pipes to an oil-filter in the basement, from which it is again raised to the oil-tank by a small pump attached to the air-pump lever.

The pump cases are of cast iron, with a diaphragm in the centre of their length, through which is fixed a gun-metal sleeve for the plungers to work in. The plungers are of cast iron, 6 feet long, with hemispherical ends. The pump-valves consist of hard rubber discs, spring closed, arranged on diagonal grids in a casting which is bolted between the suction chamber and the pump-case as to the suction valves, and between the pump case and the delivery chamber as to the delivery valves.

The author's experience of the unsatisfactory results of long suction-pipes led him to design the pumps with suction pipes only 5 feet long. These each dip into a large suction culvert formed in the concrete foundations, which has been made air and water tight by cement rendering and asphalt. The water is led into each of these culverts from a channel running longitudinally along the west side of the foundations. The suction culverts are charged with water up to within 9 inches of the roof through which the suction-pipes pass. Attenuated air will fill this 9-inch space, which will act as a large suction air-vessel, and thus prevent shock, and consequent noise, in the pumps. The air space is connected by valves to the atmosphere and to the air-pump, so that the amount of air present may be regulated.

Of the three delivery pipes from each engine, one is connected to the condenser, so that one-third of the water delivered will pass through the condenser. The condensers have riveted steel bodies; and there are in each 768 brass tubes ¾ inch diameter. The three delivery pipes from each engine are merged in a 33-inch

steel main leading to the exchange mains in the pipe-chamber. [In order to allow of convenience in working the new plant, it became necessary to design a system of exchange mains outside the engine-house.]

The exhaust from the low-pressure cylinder passes first through an oil-separator to extract the bulk of the oil, then through an exhaust feed heater, where it gives up its remaining heat to the feed water on its way to the economizer, and afterwards to the condenser. The air-pump delivers the condensed steam to a Paterson oil-eliminator, in which the remaining oil is removed by the use of a coagulant, and by passage through beds of wood wool and quartz sand.

The boiler-house joins the engine-house, and contains four Lancashire boilers, each 30 ft. by 8 ft., having each two cylindrical flues 3 ft. 3 in. diameter. They are all designed for a working pressure of 155 lbs. per square inch above atmosphere.

Coal for the new plant is stored in five reinforced concrete bunkers adjoining the boiler-house; their aggregate capacity being 600 tons. They are filled by an extension of a previously existing Temperley transporter, by which the coal is unloaded from the barges in the river. The coal is transported in skips, each containing 23 cwt., which are lowered by the Temperley transporter on to a weighing platform. After being weighed, the skips are picked up by an electric transporter and run along a beam until the skip is over the bunker in which it is to be dumped. An automatic dumping block then tilts the skip, and its contents are discharged.

Horizontal valves, worked by rack and pinion, allow the coal to drop from the bunkers into the coal-waggons, which run on a 2-feet gauge track beneath the bunkers. The track extends into, and right through, the boiler-house; and the coal is lifted direct from the waggons into the furnaces. An extension of the track to the north of the boiler-house allows the clinkers and ashes to be run to the ash bin.

THE DESSAU SYSTEM OF VERTICAL RETORTS.

The recent visit of the members of the North of England Gas Managers' Association to the Ayres Quay Works of the Sunderland Gas Company, to inspect the first installation in this country of Dessau vertical retorts, under the supervision of Mr. Charles Dru Drury, the Company's Engineer, has aroused fresh interest in the system, and a desire for some general particulars. Very opportunely, therefore, the Vertical Gas-Retort Syndicate, of 17, Victoria Street, Westminster, of which Mr. Charles Hunt is the Consulting Engineer and his son, Mr. C. Holmes Hunt, the Secretary, have issued a very artistically got-up volume, in which the history and special features of the system, and the extent to which it has been adopted, are fully set forth. The text is illustrated by a number of photographic reproductions and line diagrams; and the book presents, in a form which is worthy of a place on a gas engineer's desk, all the information he needs as to the capabilities of the particular method of carbonization dealt with. When it is mentioned that 5238 Dessau vertical retorts have been ordered, and that the total productive capacity of the installations is upwards of 70 million cubic feet of gas per diem, it will be acknowledged, we think, that this system has already attracted a considerable amount of attention.

Increased Gas Profits at Bury.

At the last quarterly meeting of the Bury Town Council, the Mayor (Mr. S. Kay), in moving the confirmation of the minutes of the Gas Committee, said the draft balance-sheet for the past year had been completed; and, though it had not been audited, he had no doubt there would be little or no alteration in the result. The income from gas and residuals sold was less than in the preceding year; but this was compensated for by a correspondingly large decrease in the expenditure, with the result that the profits for the year were £7151, as against £5721 before—being an increase of £1434. He thought the Council would agree with him that the Manager (Mr. H. Simmonds), and all concerned were to be congratulated on so excellent a result. Mr. Bradley, in seconding the motion, said it came somewhat as a surprise to the Committee to find they had made a more handsome profit than they did twelve months ago. For the first time for some years, the consumption of gas had decreased in the borough; but they knew the principal reason for this was the short time that had been worked in the mills. They had more gas-boilers out and more new meters supplied during the past twelve months than had been the case for a considerable time. If trade improved, the Committee would naturally look for some improvement again in the consumption of gas. He thought the result reflected great credit on the Manager. Everything had been kept up to the highest pitch; and the works were in a splendid condition, and would compare favourably with those of any gas undertaking in the country. The minutes were confirmed.

Unprofitable Electric Lighting at Limerick.—At the last meeting of the Limerick Corporation, a resolution was unanimously adopted recommending that a competent expert, with a practical knowledge of the working of a successful electric power station, should be employed to examine and report on the plant and the working of the municipal electric light undertaking. A circular sent to each member by the Town Clerk shows that the actual loss on the concern up to the 31st of March last was £8140, exclusive of bad debts; and the loss on the year's working to the same date was £1255, or about 4½d. in the pound on the rates.

REGISTER OF PATENTS.

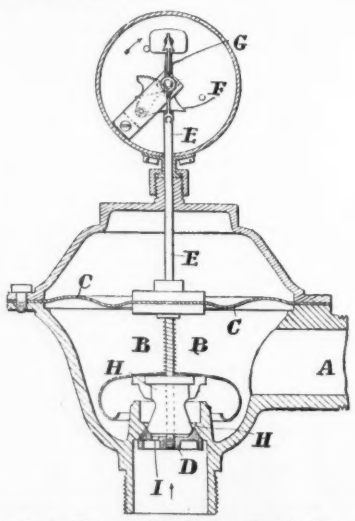
Governing or Regulating the Pressure of Gas.

CALDWELL, H. M., and SMITH, T., of Kentish Town, N.W., and ROSS, F. W. F., of Harley Street, W.

No. 284; Jan. 5, 1909.

This invention relates to the governing and regulating of gas pressure, either with or without an indicator.

The arrangement consists of the following, among other features: (1) A new form of inlet from the gas-main into the apparatus, comprising a coned or other valve seating. (2) The provision of a special valve controlling the inlet from the gas-main into the apparatus. (3) A baffle-plate or baffling device to act in conjunction with the special valve controlling the inlet from the gas-main into the apparatus. (4) A secondary valve or relief valve to act in conjunction with the special controlling valve; the valve being slidably mounted on the valve spindle which carries the special valve, or so mounted on the special valve that the two valves can be normally raised and lowered together, while also the relief valve can be raised and lowered on the spindle, or independently of the special valve. (5) Means for imparting varying pressure upon, or for differentially acting upon and in conjunction with, the valve controlling the inlet from the gas-main into the apparatus. (6) The provision of a weight or weights and spring or springs to exert constant downward pressure on the special valve, and also adapted to act on a septum or flexible diaphragm which divides the container into two compartments, so that one of such compartments (preferably the lower) is gas-tight.



Caldwell, Smith, and Ross's Gas-Supply Governor.

The operation of the apparatus shown is as follows: When all the lights are turned off or all gas consumption is stopped, so that the passage of gas through the outlet A is stopped, the pressure rises in the chamber B and forces upwards the flexible diaphragm C, and this and the pressure in the main forces the special valve D up against its seating and holds it there. The spindle is thus forced to its highest point, and the top end E, acting on the crank arm or lever F, forces the latter upwards until the upright weighted arm G is brought over its dead centre, in which position the pointer indicates on the dial that no gas is passing. If, now, one burner is lighted, this will reduce the pressure in B; and thereupon the reaction of the diaphragm C will tend to force the valve D downwards a slight distance, and thus move it a little off its seating. The downward movement of the spindle E allows the weighted arm G to rock a slight distance to the right (in the direction of the arrow). This brings the valve into a state of equilibrium; and it remains in this slightly-open condition until one or more further burners are lighted, whereupon it descends still further, so as to allow a proportionate further supply of gas to enter the apparatus. Simultaneously, the weighted arm will be moved a further distance in the direction of the arrow, and thus again establish a state of equilibrium of the valve.

In the event of any excessive pressure arising in the main above the normal pressure for which the apparatus is adjusted, the effect would be to force the valve D up against its seating, and hold it there until the pressure was again reduced to or below the normal pressure. During this period of excessive pressure, gas would be stopped entering the apparatus, and, consequently, the supply of gas to the consumer. To prevent this happening, and to enable the apparatus to work whatever pressure may occur in the main, the relief valve H is provided—being so weighted or regulated that while the pressure in the main remains at or below the normal pressure to which the apparatus is set, the relief valve will remain down upon its seating and keep closed the passage I through the valve D. But, on excess of pressure arising in the main, it will force the relief valve H upward off its seating, and admit gas through I into the chamber B, and thereby allow the apparatus to work, even when excessive pressure arises in the main.

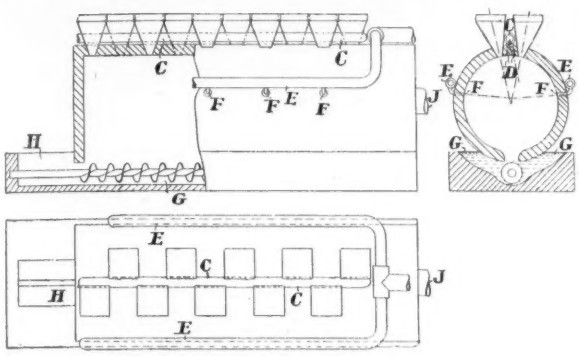
Production of Semi-Water Gas.

GOWER, J. E., of Walthamstow.

No. 7400; Oct. 27, 1909.

This generator for the production of semi-water gas is of the type in which powdered coal is dropped into a heated chamber, where it

meets with a mixture of heated air and water vapour or steam—combination taking place to produce a mixture of carbon monoxide, hydrogen, and nitrogen. The reaction is made practically an instantaneous one by highly heating the air (before introducing it into the generating chamber) to such a temperature that the powdered fuel, on dropping through the entering air-jets, is immediately attacked to form carbon monoxide. The now incandescent excess carbon particles react with the steam, water vapour, or water—introduced preferably at a lower level—so that, after passing through the entering layer of hot air, the remaining incandescent material falls through the water vapour and, combining with the oxygen to form more carbon monoxide, liberates the hydrogen. A slight excess of carbon is provided, to prevent the formation of appreciable quantities of carbonic acid; and this excess falls to the bottom of the chamber. But the reactions producing the semi-water gas are completed during the fall of the fuel through the atmosphere of the chamber; so that the mass of fuel involved is limited to that immediately taking part in the reactions.



Gower's Semi-Water Gas-Producer.

The illustration shows a side elevation of the generator (in this case cylindrical, and admitting the air and steam at separate orifices), a vertical section, and a plan.

The generating chamber is provided at the top with supply hoppers, through which the finely-divided carbon material is allowed to drop in thin streams into the interior. The hoppers are preferably staggered as shown; and the supply is directed towards the centre of the chamber. The heated air is supplied through the pipe C, with orifices D opening into the chamber between the hoppers and directed outwardly, so that the air-jets cross the falling powder and instantly attack it. The steam or water is supplied under pressure through the side pipes E with jets F, causing the water vapour to impinge from each side upon the falling carbon, which is now at a high temperature, owing to the partial combustion and the heat of the air-jets. The excess highly-heated carbon instantly attacks the water molecules, combining with the oxygen to form a further quantity of carbonic oxide; while the hydrogen of the water is set free.

Ash and any traces of unconsumed carbon that may be left drop into the water-seal at the bottom of the chamber formed by the recessed base G. This is provided with a screw conveyor carrying the residue to the open end H for removal. The semi-water gas is led off through the outlet J at one end of the chamber; the water-seal preventing any other escape.

Pressure Governors for Compressing or Exhausting Systems.

HODSON, H. M., of Herne Hill, S E.

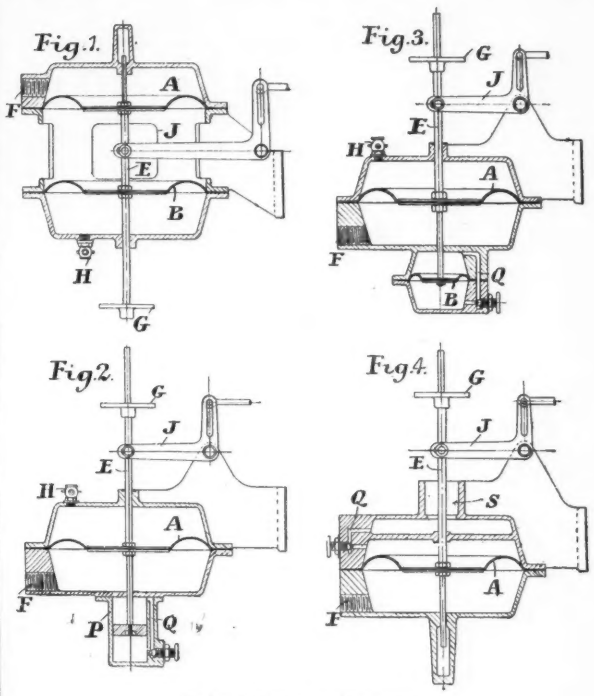
No. 8431; April 7, 1909.

According to this invention, the governor comprises (in combination) a diaphragm acted upon by the fluid the pressure of which is to be regulated; a system between the diaphragm and the motor-controlling device of the compressor or exhauster, and imparting movement to the motor-controlling device proportionate to the movement of the diaphragm; and a dash-pot arrangement for cushioning the movement of the diaphragm.

In fig. 1, the governor works with a vacuum. It comprises two diaphragms A B (for example, leather), arranged in adjoining casings, so that one central stem E is common to both. The upper side of the upper diaphragm is exposed to the vacuum maintained by the exhauster, by a pipe connection at F. The upward pull on the diaphragm is balanced by weights placed on the tray G. The lower diaphragm, in combination with its casing, forms an air-cushion; and a cock H allows air to pass in or out of the casing at such a rate that the movement of the diaphragm is regulated, and thereby any tendency to "hunting" of the engine is prevented. The diaphragm B and its casing with the cock H serves as a dash-pot to the governor. The motion imparted to the diaphragms by any change of vacuum on the upper diaphragm is transmitted through a bell-crank lever J to a rod K, which actuates the steam-throttle valve. A slot is provided in the lever, so that the movement of the rod K can be adjusted with respect to that of the lever. Any change of vacuum from that required to be maintained by the exhauster produces a corresponding change of speed in the engine driving the exhauster; so that the governor thereby tends to keep the vacuum approximately constant. When it is required to alter the vacuum to be maintained, this is effected by changing the weights on the tray G.

This form of governor can be used for regulating a pressure instead of a vacuum by inverting it, so that the upward pressure of the diaphragm A exposed to the gas is balanced by downward pressure of weights placed at the opposite side of the tray G.

In fig. 2, an alternative form of governor is shown—arranged for working with gas under pressure. By means of the gas-inlet at F, the diaphragm A has its underside exposed to the gas pressure, balanced by weights on the tray G. By means of a piston working in a dash-pot cylinder P, and attached to the diaphragm stem E, the rate of movement of the diaphragm is controlled—the passage of gas from one side to the other of the piston through a bye-pass Q being regulated by an adjustable valve. If desired to use this governor with a vacuum, it should be inverted.



Hodson's Pressure Governors.

In fig. 3, the piston and cylinder forming the dash-pot in fig. 2 are replaced by a second diaphragm B in a casing attached to the main diaphragm casing. The passage of gas from one side of the diaphragm B to the other through a bye-pass Q is regulated by an adjustable valve.

In fig. 4, the cushioning effect of a dash-pot is secured by the formation of the casing above the diaphragm A, which is divided horizontally, by a division wall, so that two compartments result in restricted communication one with the other by way of a passage Q controlled by a valve. The diaphragm stem passes through a joint in the division wall, which need not be absolutely tight. The space above the diaphragm A can contain either air or oil, or other liquid suitable for the purpose. If air be used in one compartment, then the other compartment will simply act as an atmospheric chamber, and the working of the governor will be identical with that of fig. 1.

Coin-Freed Gas-Meters.

SHAKESHAFT, C. E. M., and CLARKSON, T. J. R., of Aston, Birmingham.

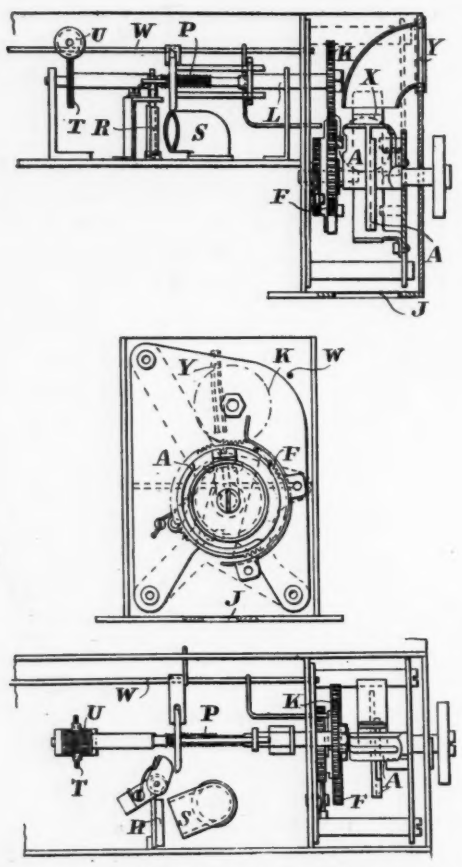
No. 24,292; Oct. 22, 1909.

This invention relates to the mechanism of prepaid gas-meters where a coin of prescribed size is inserted in a carrier capable of limited rotary movement, and adapted to lock the carrier to a wheel, which (turning with the carrier) operates mechanism for releasing a spring-controlled gas-inlet valve returned against the pressure of the spring by the ordinary measuring mechanism of the meter—p. 444.

The coin X, inserted through the slot Y, falls into the carrier A, rotatable by an exterior handle. The frame is provided with two stops which limit the rotary movement of the carrier. The example shows the carrier capable of a half-turn, which will deliver the coin, after the mechanism has been turned, to the opening J, from which it will fall into a coin-box. A change-wheel F, furnished with ratchet and pawl, so as to prevent reverse rotation, has upon its outer face two stops, against which the edge of the coin engages alternately when in the carrier for the purpose of turning the wheel F, the motion of which is transferred to the toothed wheel K, rigidly mounted on the spindle. The change-wheel has gaps, and by varying the number of teeth in it the wheel can be proportionately turned, and thus a larger or smaller quantity of gas delivered.

The spindle L has fixed to it a plate M, in which two holes are made to receive pins fixed to a nut disc mounted upon a threaded spindle P, one end of which rests in a recess at the end of the spindle L, and the other is supported by a bracket and has fixed to it a toothed wheel T, turned by the worm U, operated from the ordinary mechanism of the meter. The spindles L P rotate independently; and it will be obvious that the rotation of the spindle L will, through the medium of the pins, rotate the disc nut and draw it along the threaded spindle P, while (conversely) the rotation of the spindle P through the wheels U T will draw the disc nut back again.

A spring-controlled valve R is adapted to normally open the gas-passage S; but when the disc on the spindle P is returned (due to it being rotated by the ordinary measuring mechanism of the meter), the disc nut is pressed against a projection and thereby turns the valve R and closes the gas-passage S, which can only be reopened by drawing away the disc nut through the coin-freed mechanism operating the spindle L. The disc nut is permanently arranged within a slot in a rigid arm extending from a sliding wire W, the movements of which coincide with those of the disc nut. This wire carries an arm, the end of which



Shakeshaft and Clarkson's Coin-Freed Gas-Meter.

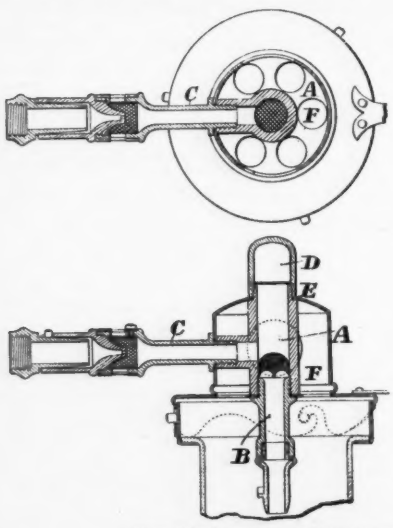
is adjusted in such relation with the change-wheel F that, when a maximum number of coins have been used, and the disc nut is at its furthest position from the valve, the end of the rod will engage the change-wheel and prevent its rotation—thus stopping the insertion of more coins. A second wire, extending through the side of the case in which the mechanism is arranged, is employed as a pointer over a gauge for the purpose of showing at any required time the amount of unconsumed gas which has been paid for.

Incandescent Gas-Lamps.

DARWIN, H., of Birmingham.

No. 24,367; Oct. 23, 1909.

This lamp has an expansion and mixing chamber in communication with a pressure-equalizing pocket or compensation chamber that "preserves a balance between the supply of gas and the delivery of combustible mixture to the burner and prevents any rise or drop in the gas



Darwin's Incandescent Gas-Lamp

pressure from producing a corresponding fluctuation in the flame in the mantle, from the fact that when the supply pressure momentarily rises its disturbing effect is taken up in the equalizing or balancing chamber to produce a corresponding increase of pressure therein, which is available to compensate for, or make good, any subsequent drop of pressure below the normal, such as usually follows each momentary rise."

The inverted lamp shown is generally of the type described in patent No. 3634 of 1909. It comprises an upright mixing and expansion chamber A, preferably of cylindrical form, and having the lower and open end leading into a smaller-bored depending burner-tube B, to which the nozzle is attached; while the chamber is supplied with gas and air by way of a horizontal branch or induction pipe C, furnished either with an ordinary coned gas-nipple and air-regulator (as shown) or with any other arrangement for delivering to the lamp gas and air in given proportions.

The horizontal induction pipe leads into the side of the expansion and mixing chamber at a little distance above the outlet end to the burner-tube; but the chamber itself is extended some distance above the point where the gas and air enters, and its upper open end is superimposed by, and leads into, a dead-ended cap or pocket-like attachment D, which constitutes the pressure-cushioning or balancing part of the lamp.

To ensure an effective cushioning action, the cap or pocket is partitioned horizontally from the upper end of the mixing-chamber by a perforated plate or diaphragm E. To assist the cushioning action, and also "to atomize and incorporate the gaseous mixture prior to combustion," a gauze diaphragm F may be located at the bottom of the mixing-chamber, between the gas and air supply branch and the burner-tube.

APPLICATIONS FOR LETTERS PATENT.

10,011.—KIRKBY, H. W., "Self-closing gas supply-valve for gas-fires." April 25.
10,034.—DUBSKY, A., "Igniters." April 25.
10,088.—HUMMEL, H. J. J., "Inverted gas-lamps." April 25.
10,150.—BONE, W. A., WILSON, J. W., M'COURT, C. D., and DAVIS, H., "Gas-fires." April 26.
10,156.—THOMPSON, H., "Gas cooking-ovens." April 26.
10,226.—DAWSON, C. E., "Producing combustible mixture of liquid fuel and air." April 26.
10,268.—MARTIN, D., "Conveyors for coal." April 27.
10,322.—COATGOUREDEN, A. DE, "Carburetting air." April 27.
10,343.—GLOVER, T., "Locking device for taps and cocks." April 27.
10,346.—HANA, G., "Air-gas apparatus." April 27.
10,357.—WHITE, M. & H. J., "Gas-generating plant." April 27.
10,371.—GODELMANN, N., "Mantles." April 27.
10,380.—PURVES, T. H., "Governor for gas." April 28.
10,400.—CAMPBELL, H., "Suction-gas producers." April 28.
10,401.—CAMPBELL, H., "Gas-engines." April 28.
10,448.—TURNER, F., "Gas burners and fittings." April 28.
10,451.—COLBRAN, J. B., "Regulating gas-nozzles." April 28.
10,495.—HELPS, G., "Gas-lamps." April 29.
10,536.—DEVOORDE, E. VON, and WILKENS, H., "Automatic lighters." April 29.
10,581.—GLOVER, T., "Locking tap or cock." April 29.
10,583.—BOOTH, H. C., "Air-gas apparatus." April 29.
10,598.—TESSIER, A. C., "Manufacturing gas." April 29.
10,641.—MARSDEN, H. R., "Gas cooking-stoves." April 30.
10,642-3.—MARSDEN, H. R., "Stop-taps." April 30.
10,667.—PRATT, W. E., "Incandescent gas-burners for billiard tables." April 30.
10,784.—DANAHER, J. W., and SLAGHT, E. E., "Gas-meters." May 2.
10,802.—PALMER, W. V., "Prepayment-meters." May 2.
10,806.—BROADBERRY, A. E., and GLOVER, T., "System of gas lighting and ventilating rooms, shops, and like places." May 2.
10,827—NOBBS, F. W., "Plate warming-fitting for gas-stoves." May 2.
10,888.—NETHERCLIFT, E. H., "Mixing air and gas." May 3.
10,894.—BOLLÉ, C., "Gas-turbines." A communication from Akt-Ges. der Maschinenfabriken von Escher Wyss et Cie. May 3.
10,931.—MAJOR, J. L., "Manufacture and production of oils from coal tars and the like, and also a pitch free, or relatively free, from uncombined carbon." May 3.
10,932.—WEEKES, R. W., "Combined installations for power generation and industrial heating." May 3.
10,967.—DEFRIES, J. W., "Plate-rack support for gas-stoves." May 3.
11,004.—BURRIDGE, W. R., "Artificial fuel." May 4.
11,029.—WHITEHEAD, H. F. C., "Valves." May 4.
11,117.—BRAYSHAW, E. R., "Gas melting-furnaces." May 5.
11,144.—GÖTZE, L., "Automatically operating the stop-cocks of water-pipes." May 5.
11,149.—STILL, W. M., AND SONS, LTD., and STILL, E. H., "Lighting and extinguishing lamps." May 5.
11,150.—STILL, W. M., AND SONS, LTD., and ADAMSON, A. G., "Mantles." May 5.
11,173.—FERGUSON, F. H., "Inverted gas-lamps." May 5.
11,230.—EISNER, A., "Self-igniting incandescent mantles." May 6.
11,258.—SOMERVILLE, J. M., "Inverted gas-lamps." May 6.
11,264.—PILLIVANT, F. T., "Boxes for mantles." May 6.
11,268.—KEITH, J. & G., "Controlling the ignition and extinction of gas-lamps." May 6.
11,269.—KEITH, J. & G., "Pressure-regulating devices for controlling the supply of gas to burners." May 6.
11,308.—CLAUGHTONS (LEEDS), LTD., and AUSTIN, E., "Automatic gas-controllers." May 7.
11,320.—RICHMOND GAS STOVE AND METER COMPANY, LTD., and SHERBURN, W. H., "Grilling or like cooking apparatus." May 7.
11,347.—PLOWMAN, T. A. B., "Pneumatic apparatus for the control of gas-burners." May 7.
11,357.—GLOVER, T., "Fuel for gas-fires." May 7.
11,362.—DELAGE, M., and WOOG, P., "Electrically lighting gas-burners." May 7.
11,364.—FALDING, F. J., and CATHCART, W. R., "Recovery of valuable constituents from gas liquor." May 7.

The Local Government Board have sanctioned a loan of £6748 for carrying out alterations at the Portmadoc Gas-Works.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coalite Patents.

SIR,—In your issue of the 10th of May we observe statements in regard to the Coalite patents, which we ask you to be good enough to correct in your next issue.

You state that the Coalite Company have been unsuccessful in defending their master-patent, and their claim to a monopoly has been knocked on the head.

These statements are absolutely untrue; and we ask you to be good enough to correct them.

27, *Chancery Lane, W.C., May* 14, 1910. EDWARD EVANS AND CO.

[The chief interest of the foregoing letter lies in its brevity. We do not know by what right or authority Edward Evans and Co. send a letter asking us to be "good enough to correct" certain statements in regard to the Coalite patents. There is a little bit of bounce about this. The second paragraph of the letter does not contain even the gist of what we said in our last issue. Our words were (and we reproduce them) that "it was a significant piece of news that was published by the 'Iron and Coal Trades Review' to the effect that the Coalite Company had been unsuccessful in defending what they are pleased to regard as their master-patent by"—Edward Evans and Co. purposely overlooked these qualifying words—"opposing the application of a Glasgow Syndicate for a patent for producing (presumably by a low-temperature process of carbonization) a smokeless fuel." Is this the statement that is "absolutely untrue?" If so, in what respect is it untrue? We must really have a little more explanation from our correspondents before we can comply with the request repeated in the above eight-lined letter to be "good enough to correct" the statement. By the way, we have not seen any explanation or correction of the original statement in the "Iron and Coal Trades Review." Unless there has been some inadvertent missing on our part of such explanation or correction in our contemporary, Messrs. Edward Evans and Co. have lost an opportunity of getting a little advertisement for Coalite into its pages. We shall be glad to have an extended explanatory statement from them, and then we shall be in a better position to judge of what we shall be "good enough" to do.—ED. J.G.L.]

Burner Maintenance.

SIR,—I would like to draw your readers' special attention to your leader on "Burner Maintenance," because without a doubt the whole future of gas for lighting purposes depends on the attitude of gas administrators to this matter. You truly say at the outset, "We have, in household lighting, every advantage on our side but one; and the exception is that incandescent gas-burners do require, to maintain their highest efficiency, more attention than the newer forms of electric lamps." It is good for the gas profession to have this truth stated so plainly by you. In past years, gas folks recognized and met the opposition which arose; and their vigorous attitude then put their business on a more stable basis than it had ever possessed before.

Your difficulty seems to be as to the position of maintenance work amidst the multifarious duties of a gas man; and I do think it is just here that a suggestion might be offered. Why make it gas engineers' at all? Why cannot the gas engineers combine and form a strong company to do, at a profit—a profit limited to (say) 5 per cent.—what they are attempting to do spasmodically and in a great variety of ways. If the gas engineers cannot see their way to undertake such a company-promoting scheme, perhaps I might suggest that one or two incandescent mantle makers will see sufficient in the idea to take the matter up and exploit maintenance work as an adjunct to their ordinary business lines.

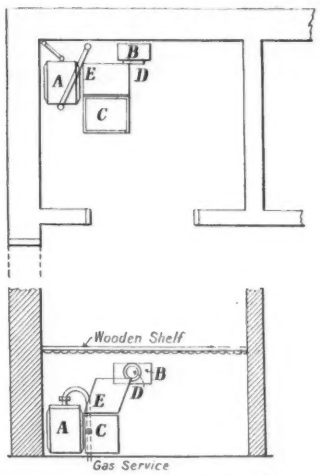
The views of Mr. Goodenough, Mr. Lewis (of Newcastle), and others who may occur to you, as to the scheme, would be interesting,

May 12, 1910. METHOD.

[We are pleased to receive this letter on the subject of "Burner Maintenance," in connection with which a second article is published in our leader columns this week. The question is one that requires to be thoroughly threshed out, and dealt with by the gas industry on well-considered lines. From any one concerned—and particularly from those with special experience and opportunities for forming judgment—we shall welcome correspondence. "Method" names Mr. Goodenough and Mr. Lewis (of Newcastle). Contributions from them would be of considerable interest to our readers; and gas managers and the superintendents of most distribution departments could contribute from their experiences much that would be helpful. Wisdom is not confined to any one quarter; and from a good accumulation of views and experiences, there may be extracted valuable guidance. There is no use in being reticent over a popularly recognized fact. It has to be dealt with; and the question is, Which of the various ways suggested and practised is the best, or is there a still better method? Our correspondent makes a suggestion as to an independent scheme of maintenance, so relieving the gas undertaking of the duty. Upon it we will not express an opinion at the present stage; but those who may take part in the discussion of the subject are invited to do so.—ED. J.G.L.]

Electrical Dangers—A Caution.

SIR,—I herewith forward you a print which illustrates the danger of the escape of electric current from defective fittings to gas pipes and fittings.



A, Gas-Meter; B, Electric-Meter; C, Coal-Vase; D, Leaky Dial Electric Meter; E, Inlet to Gas-Meter. The escaped current from the leaky electric-meter, at D, burnt a hole in the gas-pipe at E; and the current was conveyed from D to E through the lid of the coal-vase touching at both points.

From the plan you will see that the electric-meter B was fixed in close proximity to the gas-meter A, and that an iron coal-vase C had been placed between the two. When the lid of the coal-vase was opened and thrown back, it touched the dial of the electric-meter, and the inlet to the gas-meter. The dial was defective, and the electric current was conveyed to the inlet pipe of the gas-meter, which was fused, and a flame from the gas-pipe was produced quite 2 feet long. This occurred at 9.15 in the evening, and was fortunately discovered. Had it occurred a little later, when the family had retired to bed, the house must have been burnt down, and no one would have discovered the cause.

May 12, 1910. H.

LEGAL INTELLIGENCE.

LIQUIDATION OF THE KENT COUNTY GAS COMPANY.

HIGH COURT OF JUSTICE—BANKRUPTCY DIVISION.

Monday, May 9.

(*Before Mr. Justice* PHILLIMORE.)

In re W. Darby, ex parte Official Liquidator of Kent County Gaslight and Coke Company, Limited, v. E. L. Hough, Official Receiver, Trustee.

This was an appeal from the Trustee disallowing the claim of the Official Liquidator to prove in the bankruptcy of Darby for a sum of £14,000 odd (being the balance of a larger sum), undisclosed profits made by him as promoter of the Kent County Gas Company, on the sale of the property to the Company.

Mr. FRANK RUSSELL, K.C., and Mr. COLDRIDGE appeared for the Official Liquidator; Mr. JENKINS, K.C., and Mr. GREER, on behalf of the Trustee, resisted the claim.

Mr. RUSSELL said the proof lodged was in respect of two matters—the first, a sum of £1278, balance of moneys due by the bankrupt on his guarantee to pay a dividend (and this the Trustee had allowed); and the second, for damages for breach of trust as promoter of the Company. The damages were measured by the amount of profit Darby received; but credit was given him for the money spent in the promotion, and also for what he had paid on account of dividend. The facts were briefly as follows: On April 17, 1906, an agreement was made between Messrs. F. C. Lawson and Co. and Charles Archer, as Trustee for the intended Company (Lawson and Co. being only another name for W. Darby and H. W. Gyde). It recited that Lawson and Co., the vendors, were possessed of certain freehold property at Goudhurst, in Kent, and were there carrying on a gas manufacturing business; and it provided for the sale to Archer, as Trustee for the Company, of the property, plant, &c., for £21,800—20 per cent. in cash down, and the balance in cash or shares at the option of the vendors, who were to pay the expenses of the incorporation—and by another clause guaranteed a dividend. On the 2nd of May, the Company was incorporated; and on the 14th the prospectus was issued. This set forth that Lawson and Co. were the vendors and promoters; but there was no disclosure of the profit they were making on the sale. The 20 per cent. was paid on the 23rd of May, and the balance in cash on the 11th of June. It was discovered later that on the 13th of March (rather more than a month before the sale to the Company) Darby and Gyde purchased the property for £2350 only; the vendors being the Goudhurst Gas Company and certain other parties who were evidently mortgagees. The Trustee had rejected the proof on two grounds—first, that there was no evidence of non-disclosure; and, secondly, that there was no

legal liability to refund this profit under the circumstances, even if there were no disclosure. He submitted that the promoter was in a fiduciary position towards the intending shareholders, as had been decided in the Olympia case (2 Ch., 1898) and in that of the Leeds and Hanley Theatre of Varieties, Limited (2 Ch., 1902); and was therefore liable to repay the secret profits he had made. He did not suggest for a moment that a promoter could not make a profit; on the contrary, he might buy property for £5, and sell it to a company for £50,000, provided always that he disclosed the fact. Counsel cited passages from the cases to which he had referred in support of the proposition he had put forward.

Mr. JENKINS said the amount concerned was large; and as there were many other claims, the Trustee felt bound to take the opinion of the Court upon the question. His main point was that the promoter was not in any sense the agent of the Company or of the intended Company when he acquired the property; and this being so, the only remedy open to the Company, when they discovered that the property had been purchased by the vendor for a small sum, was to repudiate the contract and rescind it. But here they had retained it. The Liquidator had, in fact, since sold it; and the authorities showed that in such circumstances they could not claim the secret profit. He cited the case of the Cape Breton Company (29 Ch.D.) and *Ladywell Mining Company v. Brook* (34 Ch.D.) to show that the present case was distinguished from those mentioned by his learned friend.

At the conclusion of his argument, without calling for a reply,

Justice PHILLIMORE gave judgment. He thanked Mr. Jenkins for the way in which he had arranged and analyzed the cases, and said that, in his opinion, the decision in the Leeds and Hanley case might have put the coping-stone on an alteration of the law, which was gradually being built up from the time when the House of Lords criticized the judgment in the Cape Breton case. He could not speak positively on this point; but once one was clear what the decision in the Leeds and Hanley case meant, one could not suppose it was intended to overrule previous decisions. At any rate, he thought that case was conclusive of the present. The facts here were very short. Some time before Nov. 30, 1905, Darby and Gyde, as they then called themselves, purporting to form a firm of Darby and Co., contracted to buy the *locus in quo* on which these gas-works stood, with the plant, &c. On March 13, 1906, they bought it from the mortgagees and personal representative of their original vendor. On April 17, the same people, purporting to carry on business under the name of F. C. Lawson and Co.—an unexplained change—purported to sell it to a Trustee for a Company to be formed, which Company was formed, and its Liquidator was making the present application. The Company was incorporated on May 2; and on May 14 the prospectus was issued. The agreement was confirmed on the 31st of May; and on June 11 the balance of the purchase-money was paid and the conveyance taken. On March 13, Darby and Gyde paid £2350 for the property, which on April 17 they sold for £21,800; thus making an enormous profit. This they were quite entitled to do, because they were not buying as agents or trustees for the then non-existing Company whose Liquidator was now suing. The point put against them was that they were bound in this case, being also promoters, and having issued a prospectus, to make it reasonably clear on the prospectus that they were doing something of the kind. The prospectus stated that the Company was formed to acquire as a going concern from Lawson and Co. the old-established freehold gas-works at Goudhurst, including the benefit of existing contracts; and there was a clause stating that the agreement of April 17, 1906, had been entered into. It would not be a very harsh thing to say that in this there was a *suggestio falsi*, because, referring to this as an old-established business, and mentioning no title or date by which Lawson and Co. had acquired it, it certainly would lead an ordinary careless person to assume either that Lawson and Co. were carrying on an old-established business, or at any rate that they were the people who succeeded to it, and were not making a claim as speculators to sell at a profit. He would not, however, rest his judgment on this, but would assume that there was nothing, so far, which could be said to be fraudulent. Then came the question as to whether these people, having bought with the intention of establishing a company and reselling as soon afterwards as they did, were not bound to disclose so large a profit as they were making. Of course, common sense must be applied to these transactions; and when a man said he was a promoter, one expected that he would get a profit. If he were selling his own business, he would probably put a sanguine estimate upon it. If the original owners had been selling, and had worked out the price by capitalizing the value of the contracts, without making sufficient deductions for repairs or uncertainty, or taking too many years' purchase—all these were matters one would expect, and against which intending investors must protect themselves. Again, if one knew or suspected that the vendors were not the people who had carried on the business, they would be expected to put a reasonable profit on the turnover. Such cases must be dealt with on common-sense principles; and any claim founded on them would probably be discountenanced. But here were people who within a few months were buying at £2350 and selling at £21,800; and if ever there was a case in which an undisclosed profit ought to be disclosed, this was one. Most of the cases cited by Mr. Jenkins were cases of misfeasance against directors, and did not touch the matter at all. The principle was this—that where people promoted a company and invited corporators to join, by this mere fact they entered into a fiduciary relation with these corporators which imposed upon them certain duties. It was for this reason that they were bound to disclose the profits; and if they did not do so, the profits so made might be taken from them. As was said in one of the cases cited, it was analogous to a trust for unborn children; and in respect of such a breach of trust they might be called upon to pay damages, the measure of which was the amount of profit they had taken. He therefore thought that the claim was made out, and that it was provable in the bankruptcy; and therefore the proof must be allowed.

Mr. RUSSELL asked for his costs out of the estate.

After some discussion, these were allowed. With regard to the costs of bringing up Darby and Gyde in custody to give evidence, if necessary, his Lordship said that this was a matter for the Taxing Master to deal with.

AFFAIRS OF THE MID OXFORDSHIRE GAS COMPANY.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, May 11.

(*Before Mr. Justice* SWINFEN EADY.)

Bernstein v. Mid Oxfordshire Gaslight and Coke Company, Limited.

This was a motion for the appointment of a receiver and manager of the Company.

Mr. CHRISTOPHER JAMES appeared for the plaintiff; Mr. RICHARDS represented the Company.

Mr. JAMES said the Company was a limited liability concern, without any statutory powers, and they and the Trustees of the debenture deed consented to the motion. But there was a little difficulty on one point. The plaintiff sued on behalf of himself and all other holders of debentures entitled to the benefit of the particular deed under which his debentures were issued, which contained a charge on the property and undertaking of the Company in Chipping Norton, and also one on the whole assets of the Company. But there were other debentures which contained a specific charge on the property in other towns, as well as a general floating charge on the whole assets. As the plaintiff was suing on behalf of the holders of one series of debentures only, he felt a little difficulty in asking for the appointment of a receiver and manager of the whole undertaking, because the holders of the other series of debentures had rights *pari passu* with them over the general assets, and specific charges on the gas-works at Bicester and other places.

Mr. RICHARDS said notices of motion had been received on behalf of two other debenture holders, which would come before Mr. Justice Parker next day.

After some discussion,

His LORDSHIP said it was very undesirable to have separate actions proceeding in different branches of the Court. He suggested that the writ should be amended so that the plaintiff might sue, so far as the floating charge was concerned, on behalf of all persons entitled to the benefit of that charge. He (his Lordship) could then appoint a receiver of the particular undertaking at Chipping Norton, and also of the floating assets. When the other motions came before Mr. Justice Parker, an arrangement could be made for transferring the actions to him, or the present action to Mr. Justice Parker; and one order could then be made in the three actions.

It was agreed that this should be done; his LORDSHIP pointing out that separate accounts would have to be kept of the different undertakings. He appointed the gentleman named; but he was not to act as manager beyond June 30 without further leave.

Thursday, May 12.

(*Before Mr. Justice* PARKER.)

Mr. JAMES this morning brought on the motions in the other two actions, when it appeared that in each case the plaintiff was Mr. Bernstein, who was the holder of debentures in the other two series, one of which was charged primarily and specifically on the Bicester Gas-Works, and the other on the electric light undertaking at Chipping Norton, which was also carried on by the Company. Counsel explained the circumstances, and stated the nature of the order made by Mr. Justice Swinfen Eady.

Justice PARKER thought the best thing to do would be to appoint the same gentleman receiver and manager of all the undertakings and assets of the Company, but to manage separately, and keep separate accounts of the undertakings and property respectively mortgaged by the three several indentures. Then the two actions before him should be transferred to Mr. Justice Swinfen Eady; and the order would be drawn up as one order in the three actions. Meanwhile the receiver and manager would act on the plaintiff undertaking to be responsible to the Court for his receipts.

Mr. PATTERSON, who appeared for the Trustees of the deed affecting the Bicester undertaking, said it was important that separate accounts should be kept, as, having regard to the terms of his deed, he thought questions of priority might arise.

His LORDSHIP said the order would direct separate accounts to be kept.

Position of the Beaufort Gas Company.

At the Tredegar County Court last Tuesday, an application was made, before his Honour Judge Hill Kelly, for the winding-up of the Beaufort Gas and Lighting Company, Limited. Mr. A. J. Parsons (instructed by Messrs. Vaughan and Harris, of Brynmawr), who appeared for the petitioning creditor, applied for an adjournment, as he anticipated that the matter would be arranged. There was no general body of creditors to oppose or support, and the application was adjourned to the next Court.

Meters Limited.—The accounts of this Company for the year ended the 31st of March, which will be submitted at the ordinary general meeting next Tuesday, show that the trading has resulted in a gross profit of £33,017, which is reduced by general management expenses, Directors' fees, legal charges, expenses on patents, income-tax, and depreciation of buildings, machinery, and plant. A sum of £3078 has been spent out of revenue on repairs and renewals. After providing for interest on debenture stock, the net profit amounts to £22,732, which with £2461 brought forward makes £25,193, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares, and at the rate of 4 per cent. per annum upon the ordinary shares, were paid in November last. The Directors now recommend that further dividends be paid at the rates of 5½ and 8 per cent. per annum (making the ordinary dividend 6 per cent. for the year), that £6009 be added to the reserve fund, raising it to £66,000, and that the balance of £2796 be carried forward.

MISCELLANEOUS NEWS.

BOMBAY GAS COMPANY, LIMITED.

An Interesting Retrospect.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting and the certificate of the Auditors; and the Directors' report and accounts (a notice of which appeared in the "JOURNAL" for April 19, p. 192) were taken as read.

The CHAIRMAN said they were met under the shadow of a great national calamity. They had lost their King and the Emperor of India, where they carried on business. In him they had been deprived of a great King and a great friend of his people. He was sure it would only be in accordance with the shareholders' feelings if he proposed a resolution offering their respectful sympathy with the Royal Family, and pledging their devotion to the present King and Emperor of India. He therefore begged to move: "That the shareholders of the Bombay Gas Company, a British Company trading in the Empire of India, desire to place on record their deep sorrow at the death of their gracious King and Emperor of India, their thankfulness for the blessings arising from a beneficent reign, and their sympathy with the Queen Mother and Royal Family in their bereavement; and also desire to express their loyalty to King George V."

This was seconded by Mr. CLARK, and carried by the shareholders rising silently in their places.

The CHAIRMAN (proceeding) said the Company had a very encouraging, perhaps a brighter outlook than had been the case since he had had the pleasure of sitting at the Board. There was a very satisfactory development in the sale of gas (which followed upon an increase which he announced at the last meeting). The increase was 9·6 per cent., of which private consumers yielded an increase of 12·4 per cent., and public lamps 5·8 per cent. So satisfied were the Directors with the strength of the position, that they had given a further reduction in the price of gas of 4 annas per 1000 cubic feet from July 1 next. They had for some months past been giving a supply at a reduced rate for power and manufacturing purposes. If they could secure the increase they had been getting apart from such a stimulus, beyond doubt with the stimulus of the lower price this increase would be still further augmented. The increase which had come had brought out a highly satisfactory profit, which enabled the Directors to give the shareholders a dividend of 7 per cent. for the year. This they were able to recommend with the greatest confidence, because the profits had only been arrived at after the most drastic and thorough attention to the upkeep and development of the Company. The undertaking had been a good many years in existence now, and was founded on rather a large scale. Bombay was a very important city, and would make a big hole in a Metropolis like London. But such were the habits of the natives, and so slow were they to adopt the modern practices of the European tastes and fashions, that the concern did not for very many years grow up so as to use its plant with much profit. Now, for the last four or five years, they had reached—he would not say the whole power of the plant, because the engineer who designed the works laid down a very fine arterial main, which would last a great time, and a good deal of solid building; but, at any rate, they had required a large amount of reconstruction (because things were rather antiquated) and also some extension. And inasmuch as their business on the whole, after all this development, was not so great as to justify the calling-up of new capital, the Directors had had to devote all they could secure from the earnings to carrying out these reconstructions, repairs, and improvements, so as to meet as far as possible the extra strain that had been thrown upon the works, and to provide something for the future. Looking at the accounts, they would see that there was a gross profit of £18,411, which was £2312 more than in the previous year; while the income from the sale of gas was greater by something like £3907 in private rental, and £1104 for public lighting. Then there were some small variations. The rental of gas-meters was larger—showing that a greater number of meters were in use, and more consumers of gas. He would like to be able to tell them how many consumers had been added; still he thought the shareholders would acknowledge that the form of accounts during the past few years was a great improvement on the old style. The receipts from coke were somewhat smaller, owing to the price having come down. While the income on revenue account was £4930 more, the net profit was larger by only £2312; and the proprietors would naturally ask what had been done with the other £2618. Of course, they could not sell more gas without making it; and some of the money had had to go in extra coal, wages, &c. But the explanation was largely—and this was his pride—that there had been a great outlay on repairs and maintenance of works and plant (£6481), and on repair, maintenance, and renewal of mains and services (£6009). Altogether something like £12,500 had gone in repairs, &c. These two items—one was rather less, and the other somewhat larger, than in the previous year—accounted for a considerable proportion of the £2618. The dividend, therefore, had not only been earned, but it had been earned after they had had the satisfaction of spending the large amount on repairs to works and mains to which he had just referred. This showed how well the undertaking was working. The amount of gas brought into account was satisfactory, and as good as in many of the works in England. The working was, in fact, quite up to date, and reflected the greatest credit upon their Engineer (Mr. A. R. Burch) and on his Assistant (Mr. W. T. Lane). It was about 1893 that he (the Chairman) first came into the Company's service as a Director. From 1892 to 1895, the price of gas averaged 76d. per 1000 cubic feet, and the profit was 31½d.—it amounted to £14,439 on the average of three years; while the repairs averaged £4014. In the last three years, the price had been reduced to 73d. per 1000 cubic feet; while the profit, being earned on a much larger volume, was 24½d., or 7d. per 1000 cubic feet less than before. The profit amounted to £16,400 on the average of the three years; and the repairs averaged £13,000—that was to say, the outlay appeared under the head of repairs, but it was really very largely for reconstruction and bringing things up to date. If he added to this a figure which they had applied in this way from another source, it came to £15,600 a year. While, therefore, they had been spending four times the amount on their works, they were getting an equal dividend out of a smaller profit per 1000 cubic feet, and a lower price for gas. Then a matter which should interest them very much indeed was the growth of development. The sale of gas in 1892 was 107 million cubic feet; whereas now it was 177 millions. In 1892, the public lighting amounted to 59¾ per cent. of the whole (and the loss of this single contract would have meant the loss of 60 per cent. of the trade); the balance of 40¼ per cent. being private lighting. Last year the figures were 59 per cent. for private lighting, and 41 per cent. for the public lighting. Mr. Burch, in his last report, stated that the private lighting was going on increasing at the rate of 16 per cent. at the present day. With reference to the public lamps, a self-intensified inverted lamp of the Graetzin type had been adopted; and the extension of present lanterns and "C" burners had been stopped. Certain streets had, with great success, been lit with three-light lamps of this type suspended in the centre of the road. At the last meeting, he expressed the opinion that the future development of public lighting ought to be in the direction of the inverted burner, which threw its light downwards, and not the perpendicular one, which threw its light to the sky. He trusted their representatives would take care to keep Bombay as it had some years ago been said to be by an Australian engineer—"the best lighted city he had seen" either in Asia or Europe. There was a large business being done in piping and fitting for private lighting. They had just had their Assistant-Engineer, Mr. Lane, over here; and he assured them that they really could not get on fast enough with this work. He suggested facilities in the way of motor-cars for getting the men about quickly; and this was having consideration. In fact, the natives were learning to use gas in an up-to-date manner, as demonstrated in the show-rooms of English companies, which the Bombay Gas Company had copied. They had moved their offices to one of the chief positions in the city, and had show-rooms where the public could see how to utilize gas in every way to the best purpose. This was a policy which was bringing "grist to the mill" of all the English companies; and it had proved to be as successful in Bombay as in London, Eastbourne, and Wandsworth. These were very inspiriting facts. They gave him an amount of satisfaction which militated against putting into operation an intention he had formed a year or two ago of retiring from the Board, and surrendering his place to someone younger and better able to fill it. Another matter he must mention was that the Board had as far as possible recognized the good work of the staff and employees. They had spent a large sum of money in improving the housing accommodation in connection with the works. There had been a good deal of sickness; and the Board had given assistance to the sufferers and their families. They had also increased the salaries of the officers. The cost of living, &c., had gone up immensely in Bombay. The Company were benefiting from a great boom in business, which was also at the same time tending to make the city an expensive place for the staff to reside in. Unless they paid attention to the comfort and health of the staff, they could not hope to secure the best exertions from them. They were getting this; and the officials were entitled to the highest praise that could be given them. He was therefore sure the shareholders would approve of the course the Board had taken. As he had said, the Company had reduced the price of gas; and they believed that this course would almost inevitably lead to an improvement in the dividend, if all went well, though he did not like to make any definite promise on this head. There was one little matter which the Board wished put in order. Until a question arose, the Directors' income-tax on their fees had always been paid for them. The former Secretary, Mr. Perrins, said he distinctly recollected a resolution to the effect that this should be done; but the resolution could not be found. For some little time, the Directors had paid their own tax; but they now asked the shareholders to re-affirm the former position. He concluded by moving the adoption of the report and accounts, and that a dividend be paid of 4 per cent., free of income-tax, making 7 per cent. for the year.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw) seconded the resolution.

Mr. CUFF congratulated the Board on the excellent report, and asked what was the price of gas.

The CHAIRMAN replied that the charge to ordinary consumers was as nearly as possible 6s. per 1000 cubic feet now.

Mr. H. R. SIBSON also expressed satisfaction at the condition of affairs. There was, he said, no doubt that the prosperity of India at the present time was superior to what it was some years ago; and the Company would have their share of this prosperity. Perhaps the Board might consider it desirable to describe the "Reserve Fund" as the "Reserve Account." Undoubtedly the money was better invested in the business than in Consols, or securities of that kind.

Mr. CLARK congratulated the Board on the accounts, and suggested that, having regard to the temperature of Bombay, the reduction in the quantity of tar in store was eminently satisfactory, because the tar became liquefied, and there was bound to be a considerable loss, even with the best barrels. He noticed an item of £6000 temporary loan, and thought the capital available from the partly-paid shares should be called up. The capital would still, he urged, be very low, having regard to the large sums of money spent out of undivided profits.

Mr. A. W. OKE felt sure many shareholders would like to see a portion of the reserve fund invested in gilt-edged securities.

The CHAIRMAN replied that they could not afford the luxury of investing money in Consols and getting 3 per cent., when they could put it in the business and make it earn, as working capital, a very much larger return. Nor could they afford to call up further capital on which they would have to pay 7 per cent., while their bank would oblige them with loans at a much smaller rate of interest. He could not agree that the capital of the Company was so very moderate. Some of the Directors were connected with undertakings where the capital was in a much more satisfactory ratio to the business than in the case of the Bombay Company. The amount, apart from working

capital, actually expended on plant, mains, machinery, and buildings, was now in excess, to a small degree, of the amount of capital called up; and for working purposes they were obliged to have money which they thought it best to secure in the shape of advances when required. Perhaps for only half the year they would be paying this 3½ per cent. interest on loan—or 1¾ per cent. a year—whereas when all the capital was called up, they must pay interest, whether it was in use or not.

A SHAREHOLDER: Is electricity likely to be a severe competitor in the near future?

The CHAIRMAN said that undoubtedly electricity was a competitor for what he called the more luxurious sort of lighting—theatres, big restaurants, &c., He was afraid that, no matter how cheaply gas was sold, they would always have electricity with them. Fortunately, the rate of growth of the gas supply in Bombay had almost always been so satisfactory that they were losing nothing whatever to the enemy. In fact, he did not know whether "enemy" was the right word to use, because electricity had led people to demand more illumination, especially in open spaces, than they required before. Thus he had often found it had had the effect of increasing the demand for gas light.

The resolution was then put and carried unanimously.

On the proposition of Mr. S. SPENCER, seconded by Mr. OKE, it was agreed that the remuneration of the Directors and Auditors should be paid free of income-tax—this to apply to past as well as to future years.

The retiring Directors (Mr. H. E. Jones and Mr. Louis Penny) were then re-appointed, on the motion of Mr. BRADSHAW, seconded by Field-Marshal Sir EVELYN WOOD; and the Auditors (Mr. S. Gore Browne and Mr. J. Hill Perrins), on the proposition of Mr. CUFF, seconded by Mr. SIBSON.

Mr. F. R. SMITH proposed a hearty vote of thanks to the Chairman, Directors, and staff.

Mr. OKE seconded this; and it was cordially passed.

The CHAIRMAN, in acknowledgment, said the staff had had a very uphill time of it; but everything was now in order, and the necessity for the Secretary to make a biennial visit no longer existed, as it did before. He was certain no company ever had a more capable and devoted servant than Mr. Burch. He was realizing results in carbonizing, keeping everything up to the mark, and getting new consumers, in a way that proved the Board did most wisely in choosing him for the post.

WELSBACH INCANDESCENT GASLIGHT COMPANY.

The Mantle and Metallic Filament Lamp Businesses.

Although the proceedings were of a protracted character at the ordinary general meeting of the Welsbach Company last Tuesday, there is not a great deal referring to commercial matters (with which we are only concerned) calling for note. Lord Weardale presided; and he divided the business before the meeting into two parts—taking first of all the report and accounts, including the Austrian position, and secondly the reorganization proposals. In his remarks, he said the figures before the shareholders showed, for the first time since the reorganization of the Company in 1903 (although before that period similar instances had occurred), a loss on the English business—a loss which was due, he regretted to state, partly to decreased and less remunerative trade, and partly to increased expenses. The hopes the Directors entertained a year ago that the general trade depression might disappear had unfortunately not been realized, more particularly with regard to the mantle trade, while the fears they had as to increased competition had been more than realized. He thought it right to give a hint last year to the effect that the Board had their eye on the electrical business, but that nothing satisfactory had then been put before them. In August of last year, they had the opportunity they had waited for, and worked for; and it was now a matter of history that the Company's metallic filament lamp was put on the market in September, and was most favourably received by every one other than their various lighting competitors. It was also a matter of history that they were attacked by the existing sellers of electric lamps, who carried the Company into a police court, on the ground that the Company were not entitled to their own name and trade mark on their electric lamps. This represented a considerable waste of money and valuable time in the midst of the season. While the Directors did not pretend to be unduly optimistic with regard to the future of the electric lamp, nor would he attempt to predict what that future would be, they were satisfied that they made a wise move in entering into the electric business. In the opinion of the Board, there was ground for hope that some of the lost profit in the mantle trade might be recouped. During the past season, they could not get delivery of electric lamps in sufficient quantity; but the Board believed that the arrangements made in regard to the future would prove satisfactory. They had no intention of being kept out of the electric market by futile litigation. With their perfect trading organization, there was a large business to be done; and they meant to have their full share of it, whatever it was worth. Meantime, the Company had been committed to no capital expenditure whatever in connection with the new business. The expense, however, had been considerable; and the whole cost of the special propaganda had been borne by the year under review. Respecting the mantle business, he observed that the market was there, and could be held if the Company were prepared to do the business at the price.

Concerning the accounts, he said the net result of the trading was a loss of £6000 on the English business. The difference between last year and the previous one was due largely to special reasons. There was a decline of 10 per cent. in the number of mantles sold; this being largely owing to the fact that they had not seen their way to accept many large orders which, on the face of them, would have shown a working loss to the Company, and no adequate profit on the other goods in which the Company dealt. But these orders for mantles had been snapped up by their competitors, with the object of keeping their factories running full time. They had also foreign competition to contend with. But subject always to prime quality, it must not be concluded that their competitors could manufacture or buy more cheaply than the Company. They dared not, however, reduce in anyway the well-known Welsbach quality; and, as the shareholders would understand, the Directors had to deal with the position as they found it from day to day. The dividend declared by the Austrian Company had again been 20 per cent.; so that the Company received cash and credit in the current year upon their holding in the Austrian Company to the amount of £24,600.

The motion for the adoption of the report and accounts having been seconded by Mr. W. W. Wright, there was considerable discussion, in the course of which certain shareholders appeared to think that the management and the business methods of the Company were largely to blame for the loss of business; and that the Welsbach Company ought to have no difficulty in beating their competitors out of the field by supplying the class of mantles that the existence of these competitors showed the public required. In the course of his reply upon the discussion, the Chairman mentioned that the Company have now to face in their mantle-business a class of electrical competition that was unknown when the Company were originally formed. It was also pointed out by the Managing-Director (Mr. L'ce Fletcher) that the Company had always endeavoured to treat retailers in a generous manner, and at present were allowing cash discount up to three months. The pushing of German and other mantles by the retail trade was at the present time receiving the closest attention from the Board.

The scheme of reorganization of the capital (*ante*, p. 386) was next placed before the shareholders by the Chairman, who moved a resolution approving it. In the course of his remarks, he said it would be within the recollection of the shareholders that, when the last reorganization of capital was effected, the primary object was to enable the Company to divide profits. That was seven years ago; and profits had been received and divided. In 1903-4 assets were handed over to the new Board, the net balance-sheet valuation of which was round about £450,000. Since then the preference shareholders had received nearly £220,000, and the ordinary shareholders £157,000—or about £377,000, of which a material portion had been subscribed by the Austrian Company, while the balance-sheet value of the assets to-day showed that they had not been wasted in any way. The object of the last reorganization had thus been successfully accomplished. Since then they had gradually passed step by step to a period of the severest competition, which extended now to practically every article they sold. Based upon the present outlook, there was little prospect of the Company being able to pay a dividend of 6 per cent.—amounting to £36,000—on the present preference capital, while the ordinary shareholders had no present hope of any kind either as to capital or dividend. There had been some question of postponing the scheme; but one among other reasons that led the Board to disagree with such a course was that the Managing-Director (Mr. Fletcher) had intimated to the Board that, unless the business was relieved of its present dead-weight of capital, he could not see his way to renew his agreement with the Company, which would expire at the end of next season. There was an animated discussion; and a proposal was put forward that the consideration of the scheme should stand adjourned to Feb. 10 next year. Incidentally, it was gathered that the proxies held by the Board were nearly double those in favour of the amendment. It having been elicited that Mr. Fletcher was willing, if the proposal as to adjournment was favoured, to remain in office in the meantime, so long as it was clearly understood that the responsibility for the step taken was upon the shareholders and not upon himself, it was agreed to defer the consideration of the matter to the date named.

SEQUEL TO THE BERMONDSEY EXPLOSION.

At the Meeting of the London County Council last Tuesday, the Main Drainage Committee reported that, as a result of a serious gas explosion which occurred in Grange Road, Bermondsey, on Dec. 30, 1908, several actions for damage and personal injury were commenced against the Council, the Metropolitan Water Board, and the South Metropolitan Gas Company, including one by the Bermondsey Metropolitan Borough Council for reinstatement of the roadway, &c. It was very difficult to decide as to the party responsible for the explosion; and as it was considered undesirable to expend public money in obtaining a decision of the Courts in the matter, the Council decided to enter into an agreement with the Water Board and the Gas Company by which the cost of settling the several claims and actions was to be divided among the three contracting parties in an agreed proportion, and each party released the other from all claims which they might have against each other arising out of the explosion. An account had been received from the Bermondsey Borough Council in respect of the reinstatement of the roadway, &c.; and the amount chargeable in connection with the repair of the tramway track was £528 15s. 9d. Under the terms of the agreement, this sum was payable by the Council; and the Highways Committee were of opinion that the cost should be charged to the main drainage account. The reporting Committee concurred in this view; and, as there was provision for the expenditure in the maintenance vote for 1909-10, they recommended that expenditure not exceeding the sum named be sanctioned for repairs to the tramway track. This was agreed to without discussion.

The Smoke Nuisance.—At the annual meeting of the Coal Smoke Abatement Society on the 4th inst., the Chairman (Sir W. B. Richmond), in moving the adoption of the report, said that during the ten years the Society had been in existence it had made rapid progress in London and many provincial towns. The London County Council were alert and the Borough Councils were beginning to view the smoke nuisance as an unnecessary evil. In consequence of this change of opinion, fogs caused through smoke were becoming more rare. Municipalities in all parts of the kingdom were awakening to the necessity of coping with the smoke evil; and the Committee were constantly asked for the advice and assistance which the experience of the Society enabled it to afford. The London County Council were trying to get the word "black" deleted from the Public Health Act of 1891, because some Magistrates had held that they could not convict of a nuisance unless they were satisfied that, in a literal and technical sense, black smoke was emitted.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

New Secretary and Manager—Annual Accounts.

In the report which the Gas Committee of the Birmingham Corporation will present at a special meeting of the City Council to be held next Tuesday, reference is made to the appointment of a Secretary and Manager of the Gas Department, in succession to the late Mr. G. Hampton Barber. The Committee state that the vacancy was not advertised; but its existence was widely known throughout the gas industry, as well as locally, with the result that upwards of thirty applications were received. Many of the applicants were interviewed by the Sub-Committee appointed to deal with the matter; and the Committee unanimously recommend the Council to appoint Mr. R. S. Hilton to the position, at a salary of £1500 per annum [not £1000, as stated in the "JOURNAL" last week], rising to £1600 on the completion of twelve months' service. Mr. Hilton is thirty-nine years of age, and is at present General Manager of the Clay Cross Company's Collieries, near Chesterfield. The Committee are confident that, in addition to his intimate knowledge of the coal trade—having been responsible for dealing with the entire output from collieries employing more than 3000 workpeople, as well as the production of coke and residuals from their coke-ovens and recovery plants—Mr. Hilton possesses the highest credentials, and the necessary experience in the organization and control of a large department such as the gas undertaking; and that he will prove a valuable and capable officer of the Corporation.

Accompanying the report are the accounts of the Gas Department for the year ended the 31st of March last. They show that a sum of £48,278 was spent on capital account (£24,929 of it being for extension of buildings, £5143 for new mains, and £17,402 for new meters not in place of old ones); bringing up the total expenditure to £2,524,602. Deducting the value of buildings and plant abandoned, £63,636, a sum of £2,460,966 is produced, which is £447,983 less than the total receipts (£2,908,949). The receipts from the sale of gas amounted to £702,873, compared with £698,712 in the preceding year; while residual products realized £231,445, against £228,082. The total receipts were £940,459, compared with £935,636. On the other side of the revenue account, under manufacture, coal (including oil, carriage, unloading, and all other expenses of depositing same on the works) cost £372,759, against £369,642 in the preceding year; purifying materials and wages, £8199, against £6824; wages at works, £76,888, against £78,253; and repairs, maintenance, and renewal of works, plant, retorts, machines, apparatus, and tools (less old materials sold), £147,415, against £157,091. The total cost of distribution was £63,505, compared with £57,734; and the remaining items brought the expenditure up to £750,525, against £745,335 in 1908-9. There is thus on the present occasion a balance of £189,934 to be carried to the profit and loss account, compared with £190,301 in the previous year. After meeting interest and other charges, there is a net balance of £72,491, which compares with £71,459 last year.

The quantity of coal carbonized in the past twelve months was 568,733 tons, and of gas oil used 2,933,035 gallons. The gas sold and used on the works amounted to 7,205,806,700 cubic feet. The average net price of gas was 1s. 11·41d. per 1000 cubic feet, compared with 2s. 0·03d. Coke and breeze realized £139,210; tar, £38,734; ammoniacal liquor, £53,394. The estimated quantities made were: Coke, 309,018 tons; breeze, 65,236 tons; tar, 6,756,143 gallons; ammoniacal liquor, 23,654,698 gallons. Of coke, 224,027 tons were sold, and 82,086 tons used.

The following are some statistics of the gas undertaking for the years ended March 31, 1909 and 1910:—

—	1909.	1910.	Increase.	Decrease.
Gas sold (cubic feet)	6,977,793,200	7,205,806,700	228,013,500 = 3·27 per ct.	—
New services laid	8,117	7,937	—	180
Cooking and heating stoves sold	643	572	—	71
Number of cookers supplied to prepayment consumers at March 31	48,444	56,046	7,602	—
Number of cooking and heating stoves on hire, do.	7,351	9,724	2,373	—
Number of prepayment meters fixed, do.	62,431	69,028	6,597	—
Coke, breeze, and coke dust in stock, do. (tons)	6,417	8,301	1,884	—

The contributions of the Gas Department for public purposes during the year were—

In aid of the improvement rate	£72,492
Interest on reserve fund	4,000
In aid of public lighting within the city	9,159
In aid of court lighting within the city	2,069
In aid of public and court lighting outside the city	4,304
	£92,024

Exhibitions of Gas Appliances.—Under the auspices of the Alton Gas Company, an exhibition of gas appliances for cooking, heating, and hot-water supply, manufactured by the Parkinson Stove Company, Limited, of London and Birmingham, was held in the Assembly Rooms in the above-named town from the 3rd to the 6th inst. Cookery lectures were delivered twice daily by Mrs. C. F. Pitcher. A similar exhibition has lately been held by them, under the auspices of the Gas Company, in the Floral Hall, Ashby-de-la-Zouch. It was carried out under the superintendence of Mr. G. H. Matlock, the Company's Manager, was largely attended, and was in every way successful.

BURTON-ON-TRENT GAS UNDERTAKING.

The Annual Accounts.

At the Meeting of the Burton-on-Trent Town Council last Wednesday, the accounts of the gas and electricity undertakings of the Corporation for the year ended the 31st of March were presented. The following particulars relate to the first-named undertaking.

The amount received for gas sold for public and private lighting was £42,793; meter and stove rents produced £1048; residuals, £12,990; and fittings, interest, &c., made up a total revenue of £58,218, compared with £57,183 for the preceding year. On the expenditure side of the revenue account, coal and benzol cost £18,618; stokers' wages, &c., £5082; maintenance and repair of works, £3265; interest, repayment of loans, and contributions to the redemption and sinking funds absorbed £6993; and other items made up a total of £45,825, against £48,450 before. The surplus, which is £12,393, or £3660 in excess of that for the year 1908-9, has been disposed of as follows: New prepayment meters, £612; replacement of retorts in No. 5 house, and new subway, £2512; new prepayment stoves, £154; governors and tar-towers, £66—total, £3344—general district rate, £7000; reserve fund, £2049. The quantity of gas made was 357,884,000 cubic feet, of which 330,787,400 cubic feet were sold and 3,223,800 cubic feet used on the works, &c.; leaving 23,872,800 cubic feet unaccounted for, or 6·67 per cent. of the make. The coal carbonized was 33,479 tons; the make of gas per ton being at the rate of 10,690 cubic feet, of which 9880 cubic feet were sold. The coke sold was 13,236 tons; tar, 401,912 gallons; and ammoniacal liquor, 650 tons—being at the rates respectively of 7·8 cwt., 12 gallons, and 42 lbs. per ton of coal. The number of consumers at the close of the year was 10,342; being 4834 ordinary and 5508 prepayment.

Alderman LOWE, in moving the adoption of the Committee's report, referred to the fact that the Burton Brewery Company some time ago made experiments with regard to the use of ordinary coke and coke breeze for their firing; and he learnt that the experiments proved a great success. The firm had been offenders as regards the smoke nuisance; and with the view of trying to abate it, these experiments were made. The result was that they found they had been able to fire their boilers and their coppers thoroughly satisfactorily, quite as cheaply, and at the same time had succeeded in practically doing away entirely with the smoke nuisance which they had been permitting in the past. The Brewery Company had entered into a contract for the purchase of a considerable amount of coke from them; and this showed their confidence in the advantage to be obtained by the use of coke. He mentioned the matter with the view of bringing it to the notice of other large firms in the town who might make similar experiments. This would, he believed, be an advantage to them, an advantage to the people living in the district, and an advantage to the town as a whole, as it would mean the sale of more of their coke in Burton. With regard to the accounts, during the sixteen years he had been on the Council he had heard nothing like so satisfactory a report on the finances of the Committee as the one he was presenting that day. He would go further than this, and say there had never been a report so pleasing since the Corporation had owned the works—for, after all, they were in the position that they had a larger surplus at their disposal this year than ever before, and in face of the fact that they had sold gas at a cheaper rate than ever before. After the whole of the working expenses and debt charges had been paid, they had a handsome surplus of nearly £12,400. He was glad to say that, though he felt it his duty to offer a protest a month or two back, they were able to provide £7000 towards the rates. And they were able to do a little more—viz., to put a considerable sum towards the cost of the extension of the works which they had in hand at the present time. This had been brought about, not entirely from the good management, but largely owing to the fact that the consumers had for a good many years been paying a fair price for their gas; and he hoped (he was not going to pledge himself or the Committee) that after the coal contracts had been placed, they would come to the Council and offer another concession to the consumers. During the year they had paid debt charges amounting to something like £7000; whereas only a few years ago it was as much as £10,000. They would observe also from the report that, though the consumption had been a little down on the ordinary meters, they had a very considerable increase in the sales to prepayment consumers. This was mainly brought about by the policy of providing stoves for these consumers free; and the Committee proposed to develop this policy, and hoped to meet with the same satisfactory results—a continued increase in their sales. With regard to the reserve fund account, they had decided to merge the deterioration fund and the reserve fund into one, and call it the renewal fund. At the present time, this stood at something like £26,000; but they had had heavy liabilities, and had entered into considerable contracts for the reconstruction of their works. When these contracts were completed and paid for, they believed they would have about £10,000 left in the reserve fund.

Alderman THOMPSON congratulated the Committee on their successful financial position. With regard to the Chairman's statement on the use of coke and breeze, he would like to recall the fact that some years ago, during the arsenic scare, it was found that the Corporation coke was so heavily impregnated with arsenic that its use was discontinued by the firms in the town. If the Chairman could assure them that it was now without arsenic, no doubt it would be used again.

Mr. HUTCHINSON joined in the congratulation, saying that, though wont to criticize the price of gas, he had never found fault with the management. He was glad to hear the assurance regarding the reduction in the price; for by the good luck of a new invention the electric light consumers were having a great reduction in their bills, and they ought to give gas consumers the benefit of possible concessions.

Mr. KING emphasized the value of the Burton Brewery Company's testimonial to the coke and breeze, saying that their thanks were due to them for the excellent service rendered by proving to manufacturers that its use was worth trial. No doubt it would be more economical to the purchaser and better for the finances of the town; and so far as the health of the town was concerned, it would be quite a step in the right

direction. Burton's death-rate stood very low; and if they could do away with the large volumes of smoke it would be lower still.

Alderman ROWLAND also congratulated Alderman Lowe upon the Committee's position, saying that they were beginning to reap the benefit of the policy of the last nine years. When Alderman Lowe took up the duties of Chairman, the position was not satisfactory; but the Committee adopted a businesslike attitude, and looked well ahead, with the result that to-day they could congratulate them upon having dealt with the renewal of plant. The time was now come when the ratepayers could look forward to the realization of what the Chairman had foreshadowed as to a reduction in price. He considered the report was extremely interesting. With regard to the works loans, their net debt was £36,000, against which they had in the reserve fund £34,000, so that the undertaking was almost out of debt.

Mr. WARDLE said that, while he was a member of the Committee, he would oppose any further grant to the relief of the rates above £7000. The latter was 3½ per cent. on the value of the undertaking, and was quite enough. He hoped the Chairman of the Committee would strongly oppose any further grant, as the consumers ought to be considered next. The staff deserved a great deal of praise.

Mr. AUSTIN pointed out that 6·67 per cent. of the gas was unaccounted for—an increase of 1 per cent. over the previous year.

Alderman LOWE, replying, said that theoretically there ought to be no waste of gas, but practically there was. In 89 towns, the average unaccounted-for was 5·9 per cent. All the gas made passed through the station meter; and it was easy to have a slight difference, when compared with all the meters in the town. Their meter was not nearly large enough for the work; and shortly the Committee would bring forward a proposal for a new meter-house and governors. With regard to Alderman Thompson's query, the coke and breeze was not used for malting purposes. Whether their coke was more free from arsenic than other people's, he could not say; but he had an idea it was. At any rate, they were doing what they could to meet the difficulty. The matter mentioned by Alderman Lathbury should have further consideration. He could also assure Mr. Hutchinson that when he said "the near future" he meant it. They entered on their new coal contract in June; and the matter would then come up for consideration. He entirely agreed with Mr. Wardle that £7000 was enough to give to the rates. Gas consumers now paid 5d. per 1000 cubic feet towards the rates; and it was as much as ought to be paid.

The report was then adopted.

GAS COMPANIES (STANDARD BURNER) BILLS.

Continued Opposition by the Exeter City Council.

The question of continuing the opposition to the Gas Companies (Standard Burner) Bill No. 3 was discussed at some length at the meeting of the Exeter City Council last Wednesday.

The Parliamentary Committee reported that the Bill came before a Committee of the House of Lords on the 7th of April, and its consideration, with the other two Bills with which it was associated, occupied three days. The Town Clerk (Mr. H. Lloyd Parry) had attended a meeting of the local authorities concerned in opposing the Bills to receive a report on the proceedings, and to consider future action; and a resolution was adopted that the conference considered that the opposition should be continued to the Bills in the Committee of the House of Commons. The Parliamentary Committee recommended that the Council's opposition should be continued.

Approval of the recommendation having been moved, Mr. Lucas said he thought the Council should proceed no further in the matter; remarking that they had already thrown away £100, and did not know how much more it would cost if they continued their opposition. He moved, as an amendment, that this paragraph in the minutes should be deleted. Mr. Depree seconded the amendment. He said when the question of joining the opposition to the Bill was discussed, he was told that the probable cost would be £10 or £12. He then pointed out that the Council were not likely to gain very much by opposition, while other councils had decided that it was not worth while to oppose the Gas Company, who were not bringing forward the Bill, as some people asserted, for the purpose of robbing the public. The Council had had the guidance of other municipalities in the matter. He maintained that the money already spent had been absolutely lost. Mr. Glanfield supported the amendment, and said that nearly all the corporate bodies who owned gas-works had taken the lead in trying to get what the Bill provided for. It was not likely that the Exeter Gas Company, who had the competition of the electric light to consider, would do anything to upset their customers, the consumers of gas. Mr. M'Gahey said it was proved before the Committee of the House of Lords that the new standard burner would succeed in allowing companies to supply gas of a much cheaper quality. The Bill was an important one for the city; and if the Council did have to pay £150 in opposing it, the consumers would soon make up the money. Mr. Ross said he could not agree that the efforts of the Council had been wasted. It was true that the cost had been more than they anticipated; yet it was a very important matter, as it was more than ever probable that they would find it necessary to adopt gas as an illuminant to a very much greater extent than at present. It was apparent that a very much lower standard of gas was intended, both in connection with lighting and heating. The Town Clerk said the Council were striving not so much to oppose the Bill as a whole as to secure protective clauses, in order that they might be in a position similar to that at present occupied should the standard burner be introduced.

After some further remarks, the amendment was defeated by 24 votes to 10, and the recommendation of the Committee was adopted.

The estimates of the Bury and District Joint Water Board for the year ended the 31st of March next were submitted at the last monthly meeting of the Board; and it was stated that the deficiency in the period named might be £14,081.

GAS-METER TESTING IN MANCHESTER.

Further Particulars of the Index Test.

The Official Inspector of Gas-Meters in Manchester (Mr. S. Dyson) has lately presented to the City Justices his seventeenth annual report, dealing with the work done in the year ending the 31st of March last. It furnishes the following particulars.

The number of meters tested was 41,997; showing an increase of 3438 compared with the previous year. The fees received amounted to £1670; being an increase of £134. The amount expended on equipment for the year was £51; and this, together with the ordinary expenditure of £2033, makes a total of £2084. There were 1786 meters rejected, or 4·25 per cent. Of the total wet meters tested—viz., 9278—253, or 2·71 per cent., were rejected; and of 32,719 dry meters tested, 1533, or 4·68 per cent., were rejected. The number of meters rejected increased from 509 to 1786, compared with the previous year, or from 3·30 to 4·25 per cent. This was owing to a number of old meters being tested which had been in use for a good many years.

For the last eight years, the "index test" has been applied, with satisfactory results, to all meters belonging to the Corporation. There are no statutory powers for this test; and it was on the recommendation of the Justices' Testing Committee that it was instituted—the Manchester Corporation consenting to pay an additional fee so that all their meters should have the indices tested, for the protection of the gas consumers. Several gas companies and corporations also send meters to be tested; stipulating that the "index test" shall be applied. During the past year, 13,304 dry-meter and 5266 wet-meter indices were tested, and 56 of them were rejected as incorrect, from the causes shown in the following table:—

Upright shaft out of action with drum-shaft	9
Incorrect number of teeth in index-wheels	5
Defective front plates and inaccurate maring	21
Damaged fittings and wheels	5
Index wheels out of action	9
Incorrect gearing	2
Indices transposed	5

The most serious cases of error were found in five meters, particulars of which are appended. The first three had been repaired by the manufacturers, and before being put into use again were submitted for testing; while the other two—viz., the 10 and 50 light meters—were both owned by the consumers, and had been in use on their premises.

5-light,	registering	100	per cent.	fast.
3 ,,	,,	50	,,	slow.
5 ,,	,,	25	,,	fast.
10 ,,	,,	150	,,	,,
50 ,,	,,	150	,,	,,

Mr. Dyson say it is important to mention that all the above meters were found correct when tested by the dial, which is in accordance with the provisions of the Sale of Gas Act, 1859, and the only test in general use throughout the country, except in Manchester and Liverpool. He points out that no general charge of carelessness can be attributed to an inspector for stamping such meters under the limited test of the measuring chambers. The defect is attributed rather to the state of the law, and the absence of compulsory powers as to the full testing of the indices or registering apparatus as well as the measuring chambers of gas-meters.

The Manchester Corporation during the past year submitted for testing 1449 meters which had been in use for 10 years and upwards, nearly all of them being owned by the consumers; and 356 of the number were found correct and 1093, or 75·4 per cent., incorrect.

Reference was made in last year's report to the testing of gas-meters for internal soundness, and to an arrangement which the Official Inspector had installed so that this and registration testing could be carried out simultaneously. Mr. Dyson says that the new system has worked very satisfactorily, and is a great saving of time as compared with the old system of using the standard holders for both tests. The chief cause of objection to this testing of gas-meters is stated by him to be the length of time occupied in carrying out the work efficiently; and some of the inspectors advocate its abolition as regards new meters. Objections will, however, he thinks, be overcome by the adoption of the improved system. To gas manufacturers, the internal soundness test of meters is of much importance; and Mr. Dyson points out that the subject has recently been dealt with in the Presidential Addresses of Mr. Kendrick and Mr. Ellery, showing the necessity of this test from the gas sellers' point of view.

Mr. A. P. Trotter, the Electrical Adviser to the Board of Trade, and Mr. S. L. Pierce, the Electrical Engineer to the Manchester Corporation, visited the office early in the year, to make inquiries regarding the testing of gas-meters under the provisions of the Sale of Gas Act, with a view to framing rules for the compulsory testing of electricity meters. Mr. Dyson is of opinion that the present system, under which the producers of electricity for sale test their own meters, is not a desirable one, but that this duty should in all cases be undertaken by an independent authority, as is already the case in the County of London and the City of Liverpool.

In July last, an Engineer of the Birmingham Corporation visited the office for the purpose of inspecting the method of index-testing; and he was so satisfied with its efficiency that he has decided to recommend its adoption in Birmingham. The Manchester and District Junior Gas Association also visited the office on the 6th of November last. The members present (numbering about 70) were much interested in the equipment and testing arrangements, and were of opinion that the "index test" should be made compulsory.

Appended to the report are photographs of the various working departments, together with the usual tabulated statistics.

The profits of the gas undertaking of the St. Helen's Corporation for the past financial year amounted to £9300; and the Gas Committee have decided to devote £5000 to the relief of the rates.

MUNICIPAL AND HEALTH EXHIBITION.

There was very little to notice, so far as readers of the "JOURNAL" are concerned, at the Second Municipal and Health Exhibition, which was held at the Royal Agricultural Hall, Islington, last week. The most important stand was that of Moffat's Limited, at which there was an excellent show of upright and inverted incandescent burners and Lucas lamps specially adapted for public lighting. Adjoining their stand was one at which Messrs. S. Cutler and Sons exhibited a number of photographs of the works carried out by them, with lists of their gasholders and water-gas plants, and where could be seen in action the "Automaton" lamp-lighter, which was fully described and illustrated in the "JOURNAL" for the 3rd inst. At a small stand not far from those just referred to visitors could see the Praed patent safety gas-producing plant, which is said to be suitable for the supply of gas to buildings beyond the reach of ordinary gas-works. The gas is produced from petroleum vapour and air; and it can be used for lighting, heating, and cooking.

The various forms of road making were features of the exhibition; and in this connection mention may be made of the "Rapid" tar-spraying machine, of 320 gallons capacity, shown by the Phœnix Engineering Company, Limited, of Chard. It was fitted with a patent pump, worked by gearing on the side of the machine, for spraying, and had attached to it 20 feet of armoured hose and a spray-pipe and nozzle. It was mounted on four wheels and provided with horse shafts. A hoist was shown for lifting barrels full of tar on to the machine for filling.

Messrs. W. Weeks and Sons, Limited, of Maidstone, had on view a small hand-spraying machine, and a new horse-drawn automatic pressure tar-spraying machine; the chief advantage claimed for the latter being that it can be set to spray tar on the road surface at any desired rate, and will do it uniformly, irrespective of the speed at which it is drawn. Messrs. Henry Balfour and Co., Limited, of Leven, Fife, showed a reversible mixer, which could be used either as a concrete mixer or as a tar-macadam machine. The firm state that they have had it under test for both purposes, and that in each case it suited the work admirably.

GAS-PRODUCER POWER PLANTS IN AMERICA.

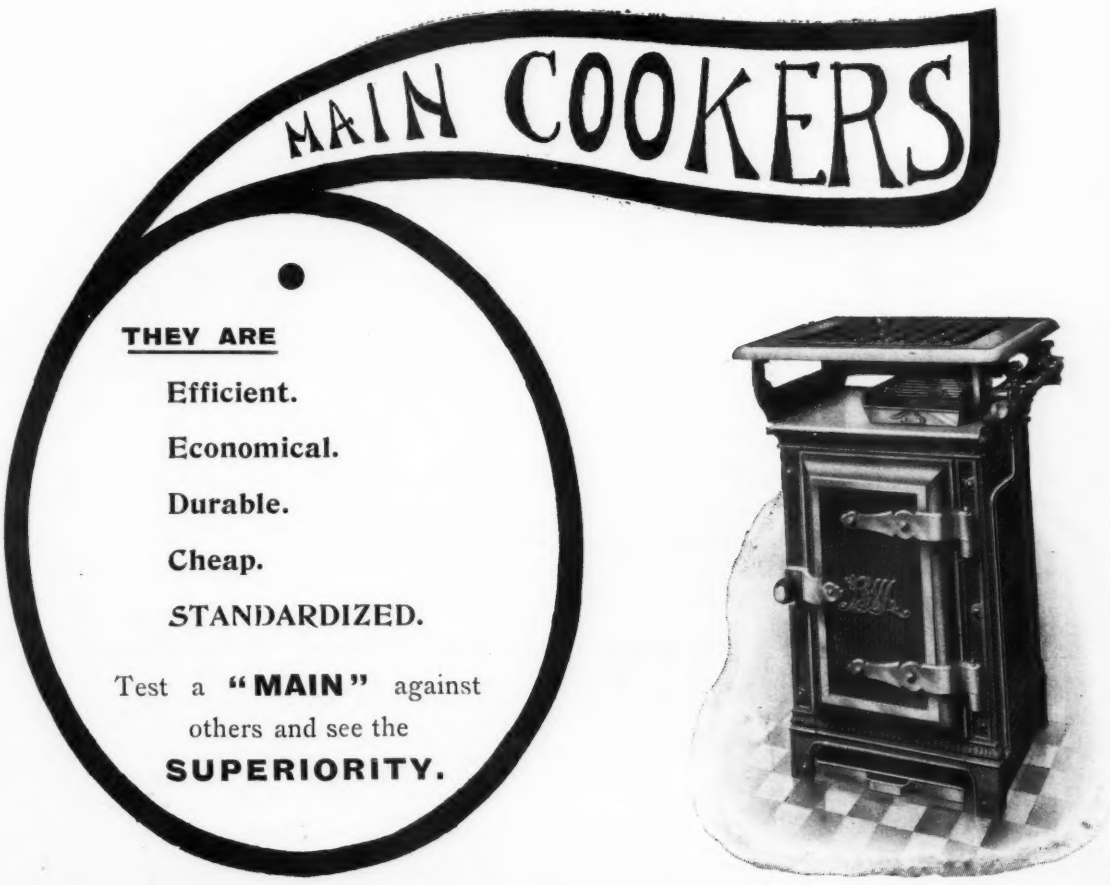
According to a report by the United States Geological Survey, more than 500 gas-producer power plants, ranging in size from 15 to 6000 H.P., are in operation in the United States. About 88 per cent. of these plants are running on anthracite coal, a few on anthracite or coke, and the remainder on bituminous coal and lignite.

In a bulletin on the recent development of gas-producer power plants in the United States just issued by the Survey, Mr. R. H. Fernald states that the internal-combustion engine has already become a serious rival of the steam-engine in many of its applications, and that the development of the large gas-engine within the last few years has been extremely rapid. Only nine years ago, a 600 H.P. engine exhibited at the Paris Exhibition was regarded as a wonder; but to-day four-cycle twin tandem double-acting engines of 2000 to 3500 H.P. can be found in nearly all well-equipped steel plants, and some contain several units rated at 5400 H.P. each.

This rapid advancement of the large gas-engine was made possible by improvements in the manufacture of cheap gas directly from fuel by means of the producer. A few scattered plants were installed for power production in the United States before 1900; but the application of engines of this type to the production of power in any general sense has been developed since that date. During the first few years of this period of development, anthracite coal, coke, and charcoal were used almost exclusively. It remainded for the Survey, in its testing plants at St. Louis and Norfolk, to demonstrate the possibility of using in such plants practically all grades of fuel of any commercial value, without reference to the sulphur or tarry matter they contain.

The tests made by the Survey—168 in all—included 138 on bituminous coals, 9 on sub-bituminous coals, 10 on lignite, and 11 on miscellaneous fuel. The average consumption of fuel for a brake-horse-power-hour was 1·36 lbs. of bituminous coal, or 1·99 lbs. of lignitic coal; the minimum consumption being 0·84 lb. and 1·48 lbs. respectively. Comparative tests of 75 bituminous coals under a water-tube boiler and in a gas-producer showed that the average fuel consumption per brake-horse-power in the steam plant was 2·7 times that in the producer plant. Several low-grade coals and lignites that were of little value, or even worthless under the steam-boiler, gave excellent results in the producer. Other low-grade fuels—such as roof slabs, culm, and washery refuse, and even a bone coal that contained 44 per cent. of ash—have been used to advantage in the producer under proper commercial conditions.

Professor Fernald solicited the views of the principal manufacturers of gas-producers on the present status of these plants as sources of power, with particular reference to the special conditions that oppose or make for their introduction. In addition, he or his assistant personally visited 63 different plants that furnish power for a great variety of purposes, to determine their economy and reliability under average conditions. After this inspection, Professor Fernald decided: (1) That the plants as a whole are giving remarkable satisfaction in view of the brief period of development. (2) That the most serious difficulty seems to arise from lack of competent operators to run the plants, though there are many more competent operators to-day than there were three years ago. (3) That the situation regarding misrepresentations and misunderstandings resulting from incompetent salesmen has with the stronger companies greatly improved. (4) That the situation regarding trouble due to manufacturers neglecting plants that have been installed and paid for has changed decidedly for the better within the last few years.



METROPOLITAN WATER BOARD.

Estimates for the Year 1910-11—Large Deficits.

At the Meeting of the Metropolitan Water Board last Friday week, the estimates for the year 1910-11 were under consideration.

Mr. A. H. Tozer, in submitting the estimates, said that last year his predecessor, Lord Welby, stated that, so far as could be ascertained, the deficiency for the year ended March 31, 1909, would probably be £28,000. The final accounts showed the actual deficiency to be £25,289. The accounts for the year just closed (to March 31) were not completed; but he could say that the approximate result would be a deficiency of £61,084, compared with the estimated deficiency of £75,700, or an improvement of about £15,000. It was extremely satisfactory to note that while the estimated expenditure for the year was £2,963,560, the approximate actual expenditure was only £2,937,494; showing a saving of £26,000. On the other hand, the net income from water-rental was £2,759,370, compared with the estimate of £2,788,650—a decrease of £29,000. Other items of income, however, showed an increase of nearly £18,000; so that the actual falling off in income was only £11,000. Deducting this figure from the saving on expenditure (£26,000) would account for the net reduction of £15,000 in the estimated deficiency for the year. Turning to the estimates for 1910-11, the gross water-rental was estimated at £2,957,500, compared with £2,954,430 for last year. The comparison, however, would be better appreciated if based on the net rental. This was estimated for the current year at £2,788,500, compared with £2,759,370 for last year; showing an increase of £29,000. With regard to the Charges Act, criticism was sometimes made to the effect that the people of London were paying more for their water than they paid under the Companies' scales. It was quite true that, by the process of equalization, some consumers had had their rates increased; but the number who were asked to pay less, and also those whose rates had not been disturbed, far exceeded that of the consumers who were paying more than formerly. As a matter of fact, the number who had had to pay more was less than one-third of those who had either had their rate reduced or had had it left undisturbed. Taking the average over the whole of the Board's area, the income per supply, on the basis of the estimates now submitted, worked out at £2 10s. 5d.; whereas in the last year of the Companies' scale (1907-8), the average was £2 11s. 6d. From other calculations which had been made, it was clear that, instead of the Charges Act resulting in an increased income to the Board, they had really suffered loss by it. The causes appeared to be three—the increasing amount of allowances in respect of empty properties, depression in the building trade, and reduction resulting from the operation of the Charges Act. The decrease in the number of supplies laid on compared with four years ago was roughly between 6000 and 7000 per annum. His own view was that this could be largely accounted for by the change in the mode of London life. A considerable number of persons were taking up their residences outside the Board's area; and this change, he was inclined to think, would be accentuated in the future. Consequently, the Board would have to look for a decreasing income on this account. During the past four years, they had suffered from the prevalence of empty properties. The allowance last year was £140,000; and in the current estimates £147,000 was submitted. The question was serious, and would have to be dealt with. Proposals would be submitted with a view to exercising still more effective control over this matter, which had so far-reaching an effect on the Board's income. To sum up the figures given, the estimates showed a total income of £2,897,460 and expenditure amounting to £2,977,402; leaving an estimated deficit of £79,942. Passing on to refer to the working of the Board during the period of its existence (6¾ years), Mr. Tozer said that in the 3¾ years to March, 1908, there was a net surplus of nearly £30,000. The year 1908-9 showed a realized deficiency of £25,000, the year 1909-10 an approximate deficiency of £61,000, and the year 1910-11 an estimated deficiency of £80,000; so that the net deficiency on the 6¾ years' working was £136,000. In the same period, the contributions towards the redemption of debt amounted to no less than £208,000. Large sums had been charged to revenue which the Water Companies would have placed to capital—viz., proportion of salaries of engineers, £94,500; costs of Acts, £19,500; sundry items for works, £13,000, making a total of £127,000. Another abnormal payment was in respect of compensation—£170,000—making in all £505,000. In other words, the Board had to pay upwards of £500,000 which the Companies would not have been called upon to defray. Was it not fair, therefore, to say that, had the Board been in the same position as the Companies, they would have shown a surplus of between £150,000 and £200,000, instead of a deficit of £136,000? Surely the Board might fairly congratulate themselves upon the position. With regard to the debt, it amounted to £48,788,524—a decrease of £83,539 compared with the year 1908-9—in addition to £740,697 of unfunded debt.

The estimates were subjected to a good deal of criticism; but eventually they were received.

This being the last meeting of the Board for their present period of office, the Chairman (Mr. E. B. Barnard) offered a few remarks on the subject of the magnitude of the undertaking of which they have the control. He mentioned that they supply daily 7 million people with water, and employ 4000 officers and workmen. In June, 1904, they had 57 storage reservoirs; whereas this number has been increased to 62, and they have reservoir supplies of 9300 million gallons.

Votes of thanks were accorded to the Chairman and Vice-Chairman (Mr. G. S. Elliott, J.P.), as well as to the Clerk (Mr. A. B. Pilling) and his staff, for their services during the year.

Valuation of the Board's Undertaking.

A conference of the Appeal and Assessment Committee of the Board with representatives of the London rating authorities and the London County Council, on the subject of the quinquennial valuation of the

DAVIS
Gas Stove
Co., Ltd.,
LUTON.

A
COMPLAINT

which every Gas Undertaking is familiar with, when trying to induce non-users to adopt Gas for Cooking Purposes, is this:

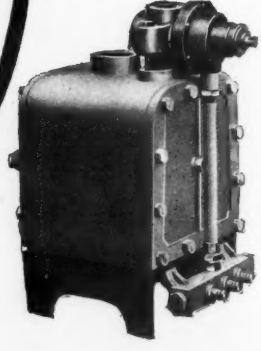
"Yes, I quite admit that a Gas Cooker is very desirable, BUT A COAL FIRE MUST BE KEPT GOING TO ENSURE A SUPPLY OF HOT WATER."

It is only necessary to introduce the "Gilled" Circulator to such a consumer to persuade him to have one installed, together with a "NEW DAVIS" COOKER. And, you remember they are both noted for

MAINTENANCE.

MANCHESTER
Show-Rooms:
Victoria Arcade,
Deansgate.

LONDON
Show-Rooms:
59, Queen Victoria St.,
City.



Board's undertaking, was held on Monday last week. Representatives of 26 out of the 35 public authorities invited were present.

Mr. E. B. BARNARD, the Chairman of the Board, who presided, said that upon matters of rating—where, if there was a deficiency, the Board would have to call upon the Borough Councils to provide it—it would be singularly inappropriate that there should be controversy and litigation; and the Board were ready and willing to work in a friendly and harmonious way with the Assessment Committees. The rating authorities outside the Metropolis, but within the Board's area, had not been invited to send representatives because they were not subject to the quinquennial revaluation.

Mr. C. G. MUSGRAVE, the Chairman of the Appeal and Assessment Committee, said they had come to the conclusion that an independent valuer should be appointed by the President of the Surveyors' Institution, and that he should value the property of the Board on the principles adopted in the year 1907 by the Court of Quarter Sessions in the action brought by the City of London Assessment Committee against the Board, and determine what part of the total valuation should be apportioned to each metropolitan rating authority. He moved—"That, with a view to avoiding litigation and the expenditure of public money, it is expedient that the valuation of the undertaking of the Metropolitan Water Board as a whole should be made by an independent valuer, acting on behalf of the Metropolitan Assessment Committees and the Water Board."

Mr. G. S. ELLIOTT (the Deputy-Chairman of the Board) seconded the motion.

Mr. W. F. DEWEY (Town Clerk of Islington) moved, and Alderman CROLE-REES (Islington) seconded, an amendment to substitute for the words "Metropolitan Assessment Committees" the words "the rating authorities within the Water Board's area." It was defeated, as was also a further amendment to adjourn the meeting and request the Board to invite the attendance of representatives from the Assessment Committees in the Board's area beyond the Metropolis.

In the course of the subsequent discussion, several members said it would be waste of public funds for the Metropolitan Assessment Committees to spend money on an independent valuation such as was proposed. In the result, it was agreed to omit all the words in the resolution after the word "valuer;" and the motion as amended was agreed to by 20 votes to 17.

Mr. G. W. PRESTON (Finsbury) moved, and Mr. BATTERSBY seconded, a motion requesting the Board to obtain the valuation alluded to in the resolution, and supply to the rating authorities of each of the parishes and places comprised within the water area the values of the portions of the undertaking comprised in such parishes and places.

This was rejected, and the proceedings closed.

The Ceará Gas Company have declared a dividend of 3 per cent. (6s. per share), free of income-tax, on the ordinary shares for the past half year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Town Council on Thursday sat in private to consider as to the procedure to be followed with regard to the Corporation Gas Consolidation Bill. At the close of the private sitting, the representatives of the Press were informed that the minutes of the Parliamentary Bills Committee, and of the Special Sub-Committee on the Bill, were submitted to the Corporation, in fulfilment of the promise given by the Convener of the Parliamentary Bills Committee some time ago. In these minutes, it was recommended that the Corporation should proceed with the Bill in the House of Lords. The members were informed that they were free to discuss the minutes, or to move any amendment which they might think fit. Mr. J. Macfarlane, the Convener of the Parliamentary Bills Committee, moved that the minutes be approved of. Mr. Barrie seconded. There was no amendment; and the motion was unanimously agreed to.

The appointment of Mr. A. Morton Fyffe, Assistant Gas Manager at Dundee, to be Manager of the Corporation Gas-Works at Nelson, Lancashire, will give much satisfaction in Scotland, where he is recognized as a very able engineer. It is also a further tribute to the good work which is being done by the Junior Gas Association. Mr. Fyffe was President of the Eastern District of the Scottish Association in 1908-9. Experience has shown that the holding of the office of President is almost invariably followed by the obtaining of a managership. Mr. Fyffe's advancement has come to him a year after demitting office. His successor—Mr. H. Rule, of Falkirk—obtained his advancement almost simultaneously with his going out of office.

Last week I referred to the movement in Dundee for procuring an amalgamation of the city with the burghs of Broughty Ferry and Monifieth, and gave some of the reasons put forward in support of the proposal. On Monday evening the Town Council of Broughty Ferry considered the subject, and resolved to refuse a request by the Corporation of Dundee for a conference. The amalgamation, it was hinted, was being proposed with a view to restoring Dundee to the position of the third city in Scotland. This position is now held by Aberdeen.

An explosion of gas occurred in a grocer's shop in West Maitland Street, Edinburgh, on the morning of Saturday last, which did considerable damage to the property, and burned and injured three of the employees. Gas was found to be escaping in the back premises. It is surmised that, on the opening of the shop, the gas which had been accumulating was carried by the draught into the front shop, and was there ignited by the pilot-light of an incandescent gas-burner.

In Blairgowrie, on Tuesday evening, there were two explosions of gas at the same place. A traction-engine had broken a gas-main, and the escaping gas accumulated in a manhole. Boys playing with matches set fire to it. The manhole cover was blown off with great force, striking and injuring one of the boys. The cover was replaced; but shortly afterwards it was blown off by another explosion.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *May* 13.

There has been a better demand this week for early delivery, which has not only been sufficient to arrest the decline in values, but has also, towards the close, brought about a slight recovery from the lowest point reached. Requirements for home consumption have been few, but for export all available supplies have been more eagerly sought after, and the quotations now are £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. For July-December delivery, makers are still asking £11 15s. to £11 17s. 6d. per ton f.o.b., according to port of shipment; but buyers are very apathetic regarding the distant months, and no new business is reported.

Nitrate of Soda.

The position of this article is unaltered; the market continuing quiet at 9s. 4½d. per cwt. for ordinary and 9s. 7½d. for refined quality, on spot.

Tar Products. LONDON, *May* 13.

The markets for tar products remain firm, especially pitch, which has slightly improved in price. Creosote is steady, though the volume of new business is not great. Benzols and naphtha remain firm; but there are no changes in prices. Crude carbolic acid is a peculiar market at the moment, and business is difficult to negotiate.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., *ex* works. Pitch, London, 40s. 6d.; east coast, 39s. 6d. to 40s. 6d.; west coast, 38s. 6d. to 39s. 6d. f.a.s. Mersey ports, 39s. 6d. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4⅝d.; North, 4¼d. to 4⅜d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2⅝d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2⅞d. to 2⅞d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0¼d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although the market is steady, the amount of new business is not very great. To-day, actual Beckton is quoted at £12; and outside makes, upon Beckton terms, £11 13s. 9d. In Hull, the price is £11 16s. 3d. to £11 17s. 6d.; Liverpool, £11 17s. 6d.; Leith, £11 18s. 9d.; and Middlesbrough, £11 17s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now fully an average production of coal in the Northern trade, and, with some diversion of orders, prices show a little ease. In the steam coal trade, best Northumbrians are from 11s. 3d. to 11s. 4½d. per ton f.o.b., with a moderate demand; second-class steams are from 10s. to 10s. 6d.; and steam smalls, being in fuller supply, are easier at from 6s. to 7s. 3d. In the gas coal trade, demand is only moderate on the long contracts; but the exports are full for this season. Durham gas coals vary according to quality—the usual classes being about 10s. to 10s. 9d. per ton f.o.b., with "Wear specials" at about 11s. 6d. per ton. As to the contracts for the large supplies of gas coal for London, it is now certain that considerable quantities have been arranged for; the price being about 10d. per ton above that of the last year's contracts. About 800,000 tons are spoken of as being arranged for one class of coal, and about 250,000 tons of another; so that it is probable that in another week most of the contracts will have been settled. One or two other contracts are usually given out soon after these; and the are in the market. Coke is now rather quieter, with good gas coke from 13s. 9d. to 14s. per ton f.o.b. in the Tyne or Wear—the output at present being lower.

Scotch Coal Trade.

There is no improvement in the market. Coal for shipment is in poor demand, and so are other sorts. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. 3d. to 10s. 6d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 322,088 tons—an increase of 8052 tons upon the previous week, and of 6667 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,365,234 tons—an increase of 710,222 tons upon the corresponding period.

The Proposed Water Board for the Rhymney Valley.—A further conference of representatives of District Councils in reference to the proposed Water Board for the Rhymney Valley was held at Hengoed last Thursday. In the result, Messrs. Wilcox and Raikes, of Birmingham, were appointed to prepare a report on the sources of supply and various other information.

Tarapaca Water Company, Limited.—In their report for the past year, the Directors state that the net profit amounts to £51,993, which, added to the balance brought forward (£6184), and allowing £1571 for income-tax, makes a total of £56,606 to the credit of profit and loss account. An interim dividend was paid on Oct. 1 last at the rate of 6s. 6d. per share—being equivalent to 7½ per cent. per annum on the paid-up capital for the period—absorbing £13,000, and leaving a sum of £43,606 to be dealt with. The Directors recommend the payment of a final dividend of 4 per cent., making 7½ per cent. for the year, and the placing of £20,000 to the reserve fund. This will leave a balance of £10,806 to be carried forward.

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Gas Profits at Brighouse.

At the meeting of the Brighouse Town Council last Thursday, a report was presented showing that a profit of £2349 had been made by the gas undertaking during the past financial year, compared with £1069 in the preceding twelve months. The Gas Committee recommended the adoption of a system of graduated discounts to large consumers on the following scales: 1d. per 1000 cubic feet on a consumption of from 200,000 to 350,000 cubic feet; 2d. up to 500,000 cubic feet; and 3d. above the latter quantity—this to be in addition to the ordinary discount of 4d. per 1000 cubic feet. The resolution was opposed by Mr. D. Hardaker (a member of the Labour party), who pointed out that whereas prepayment meter consumers were required to pay 3s. 2d. per 1000 cubic feet, ordinary consumers were only charged 2s. 7d.; and now it was proposed to give an extra discount on the top of this. The Mayor (Alderman Thornton) who is Chairman of the Gas Committee, said the slot-meter system cost the Corporation last year £716; whereas only £588 was received from this particular class of customer. Owing to the system of preferential treatment not being adopted, the Corporation had lost two of the largest consumers of gas; and this he attributed in no small measure to Mr. Hardaker's influence. The recommendation of the Committee was adopted.

Charge for Water for Hotels.—After considerable negotiation, the Water Committee of the Torquay Town Council have arranged a new scale of charges for the supply of water for hotels and similar institutions. It is based on a rate of 10d. per 1000 gallons for those which consume less than 500,000 gallons per annum. For those which use above this quantity, discounts will be allowed, on a scale ranging from 5 per cent. for quantities up to a million gallons to 20 per cent. on any quantity over 1½ million gallons. Meter-rent will be charged in addition.

Cape Town and District Gas Company, Limited.—The Directors of this Company, in the report to be presented at the annual general meeting to-morrow, state that the result of the working in the twelve months ended Dec. 31 last is a profit of £15,881. Adding the amount brought forward (£1880), makes a total of £17,761. Out of this there has been provided debenture and debenture stock interest; and the Directors recommend that the sum of £6000 should be written off for depreciation of buildings, plant, and machinery—leaving a balance of £1761 to be carried forward to the next year's account. The quantity of gas made during 1909 was 136,121,000 cubic feet, compared with 151,212,000 cubic feet in 1908. The quantity sold, however, does not show a corresponding decrease. The number of consumers at the end of the year was 5764; being a gain of 366. The average amount of gas supplied to each customer was, however, less than in 1908. The Company have to face the keen competition of the municipal electricity supply; but every endeavour is made to extend the business by the installation of prepayment meters, cooking-stoves, &c., and by cookery demonstrations and lectures.

Quality of Holyhead Water.

At the last meeting of the Holyhead Urban District Council, a discussion took place with reference to the water supply, a recent adverse report upon which had caused a sensation in the district. Dr. Clay, the Council's Medical Officer of Health, reported that an analysis of the water had been made, and that the Analyst stated it could hardly be regarded as safe to use for domestic purposes. Dr. Clay expressed the opinion that, though the water was probably contaminated by vegetable matter, and was insufficiently filtered, the report published was exaggerated. As proof that the water was not so bad as had been stated, he pointed out that the death-rate for the district was lower than that for England and Wales. A letter was read from the Holyhead Water Company pointing out that a chemical analysis of the water alone, without any knowledge as to its source and surroundings, was unreliable. The Analyst reported that the filtration had removed all suspended matter, and, though the water contained some organic matter, as it was of vegetable origin it was unobjectionable. The supply was now in very fair condition, and quite suitable for distribution. The Company expressed regret that, though the nature of the work done by the Company during the past few years to improve the supply was within the personal knowledge of many members of the Council, so much alarm and distrust should have been excited in their minds. Had a quiet request been made for an explanation from the Company's Manager, this alarm would have been dissipated. It was decided, in view of the letter, to leave matters in abeyance.

Devonport Gas and Water Profits.—The municipal undertakings at Devonport have had a very successful year. At the meeting of the Town Council last Thursday, Alderman Tozer, the Chairman of the Gas Committee, stated that the accounts which will be presented to the Committee at their next meeting will show that, after paying interest on the capital and providing for the sinking fund, there is a net profit of £3740. Alderman Blackall, the Chairman of the Water Committee, made a similarly gratifying announcement with reference to the water undertaking. He said it had been thought that the Committee would have to come to the Council each year for a grant; but so far they had been able to do without it, and this year there was a net profit of £3265. This would be carried to the reserve or contingent fund. Mr. Perkins asked if anything would be applied in relief of the rates. Alderman Blackall replied in the negative. The Council and the ratepayers must not expect anything from the water undertaking for the present. At the end of another year they would have to commence paying to the sinking fund; and in the meantime they were putting to the reserve fund, or, as he preferred to call it, the contingent fund, any profit they were making. These savings would enable them to carry it on without asking for any contribution from the rates for three years, if at all. The Town Clerk said really the money was utilized for relief of the rates, because if they had not made this profit there would next year be a demand on the rates to pay the sinking fund.

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Additional Capital for the Lea Bridge Gas Company.—The estimation in which the Lea Bridge District Gas Company is held by investors was testified last Tuesday by the remarkable rapidity with which the new issue of capital offered by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., by order of the Directors, was placed. The first lots offered consisted of £5000 of consolidated ordinary stock, ranking for a standard dividend of 5 per cent., though 1 per cent. more has been paid for some years on similar stock; and the price realized was £123 10s. to £124 10s. per £100. An issue of £4000 of 4 per cent. perpetual debenture stock fetched from £100 10s. to £100 15s. per £100; and £5000 of 5 per cent. preference stock, £114 to £115. The sale lasted only a few minutes.

Visit of Schoolboys to the Wrexham Gas-Works.—By permission of Mr. J. Braithwaite, the Engineer and Manager of the Wrexham Gas Company, the boys in the Seventh Standard at the Victoria Council Schools, under the care of the Headmaster (Mr. Chas. Dodd, F.G.S.), recently paid a visit to the gas-works to view the process of sulphate of ammonia manufacture. They were conducted through the works by the Assistant Manager (Mr. Owen Evans), who explained the method of treating ammoniacal liquor, and the manufacture of sulphate of ammonia, also the action of the Claus sulphur-recovery plant. The inspection of the plant was particularly interesting to the boys, who are studying the composition and uses of various manures. At the conclusion of the visit, Mr. Braithwaite made a few encouraging remarks to the scholars, and promised to present a prize to the boy who wrote the best essay on "The Manufacture of Sulphate of Ammonia and its Uses."

Charge for Water in the City of London.—At the last meeting of the Court of Common Council of the City of London, some reference was made to the charge for water; the subject arising on the election of Alderman Sir George Woodman and Mr. Gunton to represent the City on the Metropoliton Water Board. Mr. A. C. Morton, M.P., said in the days of the Water Companies ratepayers of the City were "robbed" to the extent of from £60,000 to £70,000 a year; but now £50,000 more was being taken out of their pockets.

Compounding for Water-Rates.—The attention of the Public Health Committee of the St. Pancras Borough Council has been drawn to the allowance made in respect of empties at Goldington Buildings, so far as water-rates are concerned. The practice hitherto has been that premises which become empty between any two quarter days of payment are subject to payment of the water-rate in full for the entire quarter. If, for instance, premises are in occupation for only one week at the commencement of a quarter, the full quarter's rate is legally chargeable. With a view of minimizing the apparent hardship which this provision might inflict, especially on owners of property let on weekly or monthly tenancies, the Metropolitan Water Board decided that an allowance of 75 per cent. may be made on the actual periods of non-occupation. The Committee report that, with a view to obtain a uniform allowance for the whole of the buildings, in substitution of the 75 per cent. for the actual periods of non-occupation on empty flats only, the Borough Treasurer has been in communication with the Metropolitan Water Board, who have written in reply to state that they are prepared to compound the water-rates on these dwellings by an allowance of 5 per cent.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER, &c. No. 5231.
DRAUGHTSMAN (CANADA). No. 5242.
SHOW-ROOM ATTENDANT. No. 5233.

Plant, &c. (Second Hand), for Sale.

EXHAUSTER, RETORT MOUTHPIECES, &c. Grays and Tilbury Gas Company.
GASHOLDER FRAMING, GIRDERS, &c. Gosport Gas Company.
MOUTHPIECES, ASCENSION PIPES, &c., BOILERS, ENGINES AND EXHAUSTERS, CONDENSERS, TAR EXTRACTOR, SCRUBBERS, PURIFIERS, GASHOLDERS, &c. Merthyr Tydfil Gas Company.

Stocks and Shares.

BARNET GAS COMPANY. May 24.
DORKING GAS COMPANY. May 24.
GAS DEBENTURES. No. 5243.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK URBAN DISTRICT COUNCIL. Tenders by May 30.
BOGNOR GASLIGHT AND COKE COMPANY. Tenders by May 26.
CARLISLE GAS DEPARTMENT. Tenders by June 1.
CIRENCESTER GAS COMPANY. Tenders by June 2.
CLITHEROE GAS DEPARTMENT. Tenders by May 26.
DENTON GAS DEPARTMENT. Tenders by May 27.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 1.

Coal and Cannel (*continued*).

GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
GLOUCESTER GAS COMPANY. Tenders by May 30.
MIDDLETON CORPORATION. Tenders by May 31.
SAFFRON WALDEN GAS AND WATER DEPARTMENT. Tenders by May 30.
SEDGLEY URBAN DISTRICT COUNCIL. Tenders by May 31.
SEVENOAKS GAS COMPANY. Tenders by May 26.
SKIPTON URBAN DISTRICT COUNCIL. Tenders by May 28.
TIVERTON TOWN COUNCIL. Tenders by June 4.

Iron and Steel Work.

MANCHESTER GAS DEPARTMENT. Tenders by June 11.

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
DENTON GAS DEPARTMENT. Tenders by May 27.
STOURBRIDGE GAS DEPARTMENT. Tenders by June 10.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 422.

Issue	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Apl 1	5	Alliance & Dublin Ord.	82–84	..	5 19 1
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100–102	..	3 18 5
200,000	5	May 12	7	Bombay, Ltd.	6⅞–6¾*	..	5 9 10
40,000	5	,,	7	Do. New, £4 paid	4⅜–5⅛*	..	5 9 3
50,000	10	Feb. 25	15	Bourne- mouth Gas and Water } 10 p.c.	29–30	..	5 0 0
311,810	10	,,	7	B 7 p.c.	16¾–16⅞	..	4 3 7
75,000	10	,,	6	Pref. 6 p.c.	15–15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	251–254	..	4 18 5
300,000	,,	..	9⅜	Do. New	183–190	..	5 0 0
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 29	4	Do. 4 p.c. Deb.	101–103	..	3 17 8
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	213–216	..	5 1 .0
246,320	,,	,,	8	Do. A Ord. Stk.	152–155	..	5 3 3
467,000	20	Apl. 1	10⅝	British	44–45	..	4 14 8
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	118–120	..	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88–90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	105–107	..	5 2 10
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	87–89	..	3 18 8
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	—	..	—
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98–100	..	4 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4–5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	6–7	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49–50	+½	6 0 0
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	86–88	..	5 2 3
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109–111	..	4 10 1
1,513,280	Stk.	Feb. 25	5⅞	Commercial 4 p.c. Stk.	106–108	..	4 16 4
560,000	,,	,,	5	Do. 3½ p.c. do.	103–105	..	4 15 3
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81–83	..	3 12 3
800 000	Stk.	Dec. 10	5	Continental Union, Ltd.	98–100	..	5 0 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138–140	..	5 0 0
492,270	Stk.	—	5½	Derby Con. Stk.	121–123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	96–98	..	5 2 0
486,090	10	Jan. 27	12	European, Ltd.	24¼–24⅝	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18½–18¾	..	4 16 0
16,198,671	Stk.	Feb. 10	4⅝	Gas light and Coke } 4 p.c. Ord.	103½–104½	..	4 9 3
2,600,000	,,	,,	3⅛	3½ p.c. max.	88–90	..	3 17 9
4,002,235	,,	,,	4	4 p.c. Con. Pref.	104–106	..	3 15 6
4,531,706	,,	Dec. 29	3	3 p.c. Con. Deb.	81–83	..	3 12 3
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93–95	..	5 5 3
82,500	,,	,,	6⅛	Do. do. 5 p.c.	117–119	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17–17⅛	..	6 5 9
131,000	Stk.	Mar. 16	7	Ilford A and C	145–147	..	4 15 3
65,780	,,	,,	5⅛	Do. B	108–110	..	5 0 0
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100–102	..	3 18 5

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	May 12	8	Imperial Continental	177–179*	..	4 9 5
1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122–124	..	4 16 9
561,000	Stk.	Feb. 25	10	Liverpool United A.	222–224	..	4 9 3
718,100	,,	,,	7	Do. B	163¾–165½	..	4 4 7
306,083	,,	Dec. 29	4	Do. Deb. Stk.	103–105	..	3 16 2
75,000	5	Nov. 26	6	Malta & Mediterranean.	4⅜–5	..	6 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100–102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	12⅜–13½	..	5 5 8
1,775,892	Stk.	Feb. 25	4⅜	Newc'tle & G'tesh'd Con	104–106	..	4 2 7
529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91–93	..	3 15 3
55,940	10	Feb. 25	7	North Middlesex 7 p.c.	13½–13⅝	..	5 1 10
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	138–140	..	5 14 4
60,000	5	Apl. 1	8	Ottoman, Ltd.	6–6¼	..	6 8 0
31,800	53	Feb. 25	13	Portsea Island A.	134–136	..	5 1 0
60,000	50	,,	13	Do. B.	126–128	..	5 1 7
100,000	50	,,	12	Do. C.	119–121	..	4 19 2
114,800	50	,,	10	Do. D and E.	100–102	..	4 18 0
398,490	5	Apl. 29	7	Primitiva Ord.	7¼–7⅝	..	4 10 4
796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5⅛–5⅜	–⅛	4 10 11
488,902	100	Dec. 1	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
1,000,000	10	Oct. 14	8	River Plate Ord.	—	..	—
312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
250,000	10	Apl. 1	9	San Paulo, Ltd.	15⅛–15⅝	..	5 14 3
62,500	10	,,	6	Do. 6 p.c. Pref.	11⅜–12⅛	..	4 18 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50½–51½	..	4 17 1
135,000	Stk.	Mch. 16	10	Sheffield A	232–234	..	4 5 5
209,984	,,	,,	10	Do. B	232–234	..	4 5 5
523,500	,,	,,	10	Do. C	232–234	..	4 5 5
70,000	10	Oct. 14	10	South African	12–12⅛	–⅛	8 0 0
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120–122	..	4 9 7
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	81–83	..	3 12 3
209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157–158	..	5 1 3
605,000	Stk.	Feb. 25	5⅝	S'th Suburb'n Ord. 5 p.c.	121–123	..	4 12 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	121–123	..	4 1 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122–124	..	4 0 8
502,310	Stk.	May 12	5	Southampton Ord.	103–110*	+½	4 10 11
120,000	Stk.	Feb. 10	6⅞	Tottenham A 5 p.c.	133–135	..	5 1 9
453,940	,,	,,	5⅝	and B 3½ p.c.	113–115	..	4 13 6
149,470	,,	Dec. 29	4	Edmonton 4 p.c. Deb.	99–101	..	3 19 3
182,380	10	Dec. 29	8	Tuscan, Ltd.	9⅛–9¼	..	8 4 2
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99–101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	113–115	..	4 0 11
255,636	Stk.	Feb. 25	6⅜	Wands- B 3½ p.c.	139–141	..	4 14 0
79,416	,,	Dec. 29	3	worth 3 p.c. Deb. Stk.	74–76	..	3 18 11

Prices marked * are "Ex div."

Lowestoft Public Lighting.—At the last meeting of the Lowestoft Town Council, a letter was read from Mr. J. Hawksley, the Manager of the Lowestoft Water and Gas Company, stating that his Board had decided to offer to convert, free of charge, all the public lamps which are at present fitted with flat-flame burners to incandescent burners, and to renew the annual contract for the whole of the street lighting by the incandescent system at the same price per lamp as is at present paid for flat-flame burners—viz., £1 10s. per lamp per annum, and 20s. per lamp per annum for providing the necessary fittings, and cleaning, lighting, and extinguishing. This will be a reduction of 10s. per lamp on the present incandescent lighting. The Company are to be asked to submit a tender on these terms.

Proposed Issue of Coalite Debentures.—The following appeared in the "Daily Mail" on Monday last week: "One or two favourable announcements on behalf of the British Coalite Company have been published recently to combat some unfavourable rumours; but we have seen no reference in any of these announcements to an impending issue of debentures. We are able to state, however, that it is contemplated within the next few weeks to offer for subscription at par an issue of £300,000 5 per cent. first mortgage convertible debentures, and that 7½ per cent. commission will be offered for underwriting. Presumably the prospectus, when it appears, will make out an attractive case in the way of estimated profits; but it seems regrettable that the Company should require more money before it can offer more convincing evidence in the way of actual commercial results as to its ultimate success."

The Westminster Public Lighting Contract.—The Works Committee of the Westminster City Council report that when recently accepting the tender of the Gaslight and Coke Company for public lighting the Council decided to ask the Company whether they would be willing, after the expiration of five years, to continue the contract for a further period of five years, on the terms of the tender for ten years, in the event of the Council so deciding, and giving the Company six months' notice before the expiration of five years of the contract period. In a letter received from the Company in reply to the inquiry they express regret at their inability to agree to the option for which the Council ask. In the Committee's report which was adopted by the Council on the 28th of April, they stated that they were endeavouring to arrange with the Gas Company for a reduction of the tender rates for the installation, in consideration of the Council paying the cost thereof on completion, instead of payment being spread over five years as offered by the Company. In another letter, the Company stated that if payment for the installation were made on the completion of the work, the quoted rates would be subject to a reduction of 7½ per cent. The Committee have accepted the quotation.

At the last meeting of the Milton Regis Urban District Council, the Gas Committee reported that they had accepted the tender of Messrs. Winstanley and Co., amounting to £1060, for carrying out extensions at the gas-works. Their action was approved.

Having passed their Jubilee by two years, the Reliance Lubricating Oil Company, of Water Lane, Great Tower Street, E.C., may fairly be regarded as one of the pioneers in the oil trade. Among their specialities is a heavy oil suitable for gas-engines of 60 to 100 H.P.

Messrs. Joseph Taylor and Co. have received orders for solid-plate lead saturators from the Londonderry, Colchester, Waltham Abbey and Cheshunt, and Blyth and Cowpen Gas Companies; and also for saturators, including all the leadwork in connection with the sulphate plants, for the Sevenoaks, Padiham, and Skegness Gas-Works.

We have received from Messrs. Fletcher, Russell, and Co., Limited, their list of gas and steam cooking and heating appliances for hotels, mansions, hospitals, large institutions, &c. It occupies rather more than 100 pages, and is a highly creditable production; the articles shown, of which there is a great variety, being printed in black on art paper, with the descriptive matter in red. The list, which is No. 247, is bound in a stiff cover artistically printed in colours. We have also received a booklet containing their new season's cooking appliances, including the series of "Palatine" cookers noticed last week.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 460.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.
UNDERWOOD HOUSE, PAISLEY.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).
ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
110, CANNON STREET, LONDON.

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.
For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

THE LIGHTING OF THE COTTAGE
at the
MUNICIPAL EXHIBITION, AGRICULTURAL HALL,
has been carried out by
EDGAR OF HAMMERSMITH.
Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.
with which is amalgamated WM. PEARCE & SONS, LTD.
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

SATURATORS made or Repaired.
Reasonable Terms (workmanship guaranteed) by a 30 Years' Saturator Maker (Labour and Plant only), at per Hour or Contract. Saturators improved. Perfect Mixing and Noiseless.
DAVIES, General Chemical Plumber and Leadburner, 117, Gallaway Road, SHEPHERD'S BUSH, W.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger. The one Machine which Discharges and Charges at One Stroke.
See Advertisement, May 10, p. II. of Centre.
ALDRIDGE AND RANKEN,
89, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy, London." Telephone: 5118 Westminster.

AMMONIACAL Liquor wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

GAS TAR wanted,
Brotherton and Co., Ltd., Tar Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

GAS OILS.

MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, April 5, p. 8.

AMMONIA. Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.
A. Lowcock, Limited, Shrewsbury.

AMMONIA Waste Liquor Disposal. Purification Plant.
Results Guaranteed. No Working Costs.
John Radcliffe, Chemical Engineer, East Barnet.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers, Works: Birmingham, Leeds, Sunderland, and Wakefield.

F. BOYALL, Contractor for Painting GASHOLDERS, OIL-TANKS, ROOFS, and all kinds of LOFT and other PAINT WORK.
70, Balcorne Street, Well Street, Hackney, N.E.

IT is Worth Your While to Buy Direct. The RELIANCE LUBRICATING OIL COMPANY supply the best value in NON-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 95s. cwt.
The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower Street, London, E.C.

APPOINTMENTS.—Ambitious Men of Parts invited to write—
HERBERT GREATOREX,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start. To you the credit is due, and I think your fee the best Investment I ever made."
BUSINESS IS REVIVING. WRITE NOW.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY, LIMITED.

WORKING FOREMAN.

THE Directors Thank Applicants for the above Post, and Beg to Inform them that the POSITION HAS NOW BEEN FILLED.

WANTED, an Attendant for London Gas-Stove Show-Room. Young, Energetic, and Experienced.
Apply, by letter, to No. 5233, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Gas Manager, for a Small Works (Stoker kept), competent to do the Plumbing Work of Brewery. Wages, 37s. 6d. per week, rising to 40s.
Apply, by letter, with full Particulars and *copies* of Testimonials, to No. 5234, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

DRAUGHTSMAN wanted (for Canada) Experienced in the Design of Modern Gas-Works Plant. Age not to exceed 28 Years. Gas-Works Experience a Recommendation.
Apply, in first instance, by letter, giving full Particulars, &c., to No. 5242, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—A Gas Exhauster by Alfred Williams and Co., London. Capacity 15,000 Cubic Feet per Hour. In good Condition. Also 19 RETORT MOUTHPIECES and LIDS, 21 in. by 15 in. Cheap.
For further Particulars, Apply to H. C. Borradaile, Secretary, Grays and Tilbury Gas Company, Grays.

GASHOLDERS—Splendid 45 feet dia- meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.
Firth Blakeleys, Thornhill, Dewsbury.

FOR SALE—Framing for Single-Lift GASHOLDER, 20 feet deep; Seven Heavy CAST-IRON Columns, 3 feet square base, 2 ft. by 1 ft. 10 in. diameter; and LATTICE GIRDERS, 2 feet deep. Removed from Tank 74 ft. 6 in. diameter.
Apply to the Gosport Gas and Coke Company, Gosport.

THE Merthyr Tydfil Gas Company have the whole of the COAL-GAS MANUFACTURING PLANT AND APPARATUS, at their Picton Street Works, FOR DISPOSAL, comprising RETORT MOUTHPIECES, ASCENSION and BRIDGE PIPES, HYDRAULIC, FOUL, and TAR MAINS, BOILERS, ENGINES and EXHAUSTERS, ANNULAR CONDENSERS, PELOUZE and AUDOUIN TAR-EXTRACTOR, TOWER SCRUBBERS, PURIFIERS, GASHOLDERS, VALVES, &c., the whole of which are in Good Condition.
Permission to Inspect and further Information may be obtained by Applying to the undersigned.
J. E. Kenshole,
General Manager.
Gas Offices, Merthyr Tydfil,
May 12, 1910.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive TENDERS for the Supply of 4000 to 5000 Tons of GAS COAL to be delivered free to their Siding at the Watermoor Station of the Midland and South Western Junction Railway Company during the Twelve Months commencing July 1, 1910, at such times and in such Quantities as may be required by their Manager.
Tenders to be sent in by June 2 next, Forms for which can be obtained from
J. P. Beecham,
Secretary.
12, Silver Street, Cirencester,
May 9, 1910.

TENDERS FOR GAS COAL.

THE Sedgley Urban District Council invite TENDERS for the Supply of 1000 Tons of GAS COAL (more or less), to be delivered at the Shut End Siding at such times and in such Quantities as may be directed.
It is desirable that a statement of an analysis of the quality of a sample of the Coal to be supplied be sent with the Tender.
Sealed Tenders, marked "Coal," must reach me not later than the 31st of May, 1910.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
Thomas R. Knight,
Clerk of the Council.
Council House, Sedgley,
May 11, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(Gas Department.)

TENDERS FOR TAR.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Gas-Works for a period of Twelve Months from July 1, 1910.
Probable Quantity, 450 Tons.
Further Particulars may be obtained on Application to the undersigned.
Sealed Tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 27th inst.
The Committee do not bind themselves to accept the highest or any Tender.
John Baldwin,
Manager.
Gas-Works, Gainsborough,
May 11, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(Gas Department.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply of 8000 Tons of Best GAS COAL (Screened, Unscreened, and Nuts), to be delivered at the Great Central Railway Station, Gainsborough, between the 1st of July, 1910, and the 30th of June, 1911, in such Quantities, Monthly, as may be required.
Sealed Tenders, endorsed "Tender for Gas Coal," giving full Particulars of the Coal offered, to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 27th inst.
No Special Form of Tender issued.
The Committee do not bind themselves to accept the lowest or any Tender.
John Baldwin,
Manager.
Gas-Works, Gainsborough,
May 11, 1910.

MANCHESTER CORPORATION.
(Gas Department.)

TO IRON AND STEEL WORK CONTRACTORS.

THE Gas Committee are prepared to re- ceive TENDERS for the IRON and STEEL WORK required for an Installation of Horizontal Retorts at their Rochdale Road Station.
General Conditions of Contract and Specification can be obtained on Application to Mr. F. A. Price, Superintendent, Gas Department, Town Hall, on payment of *Three Guineas*, which will be returned on receipt of a *bonâ-fide* Tender.
Drawings may be seen and any other Information obtained on Application to the Engineer, Mr. J. G. Newbigging, M.Inst.C.E., at his Office, Rochdale Road Station.
Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Iron and Steel Work, &c., Horizontal Retort Installation, Rochdale Road Station," must be delivered at the Gas Office, Town Hall, Manchester, not later than Twelve noon on Saturday, the 11th day of June, 1910.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
Thomas Hudson,
Town Clerk.
Town Hall, Manchester,
May 13, 1910.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such Monthly Quantities as may be required by the Company.
Tenders to state the Price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.
Further Particulars and Forms of Tender may be obtained from the undersigned.
Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Monday, the 30th day of May inst.
The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.
By order,
William E. Vinson,
Secretary.
Gas Offices, Gloucester,
May 2, 1910.

THE East Dereham Urban District Council are prepared to receive TENDERS for the Supply of about 1700 Tons of Screened GAS COAL for the ensuing Year.

Particulars and Form of Tender to be had of the undersigned.

Tenders, marked "Coals," to be sent in by Ten a.m. on Wednesday, the 1st of June, 1910, to

B. H. VORES,
Clerk to East Dereham
Urban District Council.

May 11, 1910.

DENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

COAL.

THE Gas Committee invite Tenders for the Supply of COAL; the same to be sent in on or before the 27th of May inst.

Specification and Form of Tender to be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lancs.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk to the Council.

May 13, 1910.

DENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for TAR; the same to be sent in on or before the 27th of May, inst.

Particulars may be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lancs.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk to the Council.

May 13, 1910.

BOROUGH OF CLITHEROE.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for Screened GAS NUTS, to be delivered on the Gas-Works Siding, during the Year ending June 30, 1911.

Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Thursday, the 26th of May, 1910.

ROBERT BARRETT,
Engineer and Manager.

Gas-Works, Clitheroe,
May 12, 1910.

BOGNOR GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of GAS COAL for One or Two Years, at the rate of from 4000 to 5000 Tons per Year, to be delivered free at Bognor Station, or the Gas-Works Siding (if instructed), in such Quantities and at such times as required from June 15 next.

The Directors reserve the right to accept the whole or any portion of the Quantity offered, and do not bind themselves to accept the lowest or any Tender.

Tenders are to be sent to the undersigned not later than Thursday, May 26, 1910.

By order,
FRANK G. WATSON,
Secretary.

Gas Offices, Bognor,
May 12, 1910.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the Supply of about 8000 Tons of Best GAS NUTS, to be delivered free into the Council's Boats at the Pit Wharf, or at the Railway Station, Skipton, or at the Council's Wharf adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1910, and July 1, 1911, in Monthly Quantities.

Full Particulars as to Periods and Quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton, and Tenders, endorsed "Gas Coal," are to be sent to him on or before May 28, 1910.

The lowest or any Tender not necessarily accepted.

RICHARD WILSON,
Clerk to the Council.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Town Council are prepared to receive TENDERS for the whole or part of 4000 Tons of Freshly Wrought GAS COAL, Screened or Unscreened, including NUTS (giving full Particulars of Coal, with Analysis), to be delivered at the Railway Siding adjoining their Gas-Works at Tiverton during the period of One Year, and in such Quantities as may be directed by the Gas Manager.

Further Particulars and Form of Tender (which must be used) may be obtained on Application to Mr. Clark Jeffery, Gas Manager, Tiverton.

Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to the undersigned, must be received on or before Saturday, the 4th day of June, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

By order
C. M. HOLE,
Town Clerk.

Tiverton, May 2, 1910.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Purchase of their Surplus TAR during the Twelve Months ending June 30, 1911.

Tenders (on our own Tender Form), endorsed "TAR," and addressed to the Chairman of the Gas Committee, to be sent to me on or before Friday, June 10, 1910.

By order of the Committee,
CHARLES H. WEBB, M.Sc., Assoc.M.Inst.C.E.,
Engineer and Manager.

Gas-Works, Stourbridge,
May 13, 1910.

THE Corporation of Middleton are prepared to receive TENDERS for the COAL required at the Gas-Works for the next Twelve Months.

Further Particulars and Form of Tender, which will contain a Fair Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer, Gas-Works, Middleton.

Tenders, addressed to the Chairman of the Gas Committee, endorsed "Coal," must be delivered at my Office not later than Tuesday, May 31, 1910.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
May 13, 1910.

CITY OF CARLISLE.

THE Gas Committee of the City of Carlisle are prepared to receive TENDERS for COAL and CANNEL required at their Works during One Year Commencing the 1st of July next.

Tenders, endorsed "Coal," and addressed to the Chairman of the Gas Committee, must be delivered before Five p.m. on Wednesday, June 1, at the Gas-Works Office, Victoria Viaduct, Carlisle.

The lowest or any Tender not necessarily accepted.

Forms of Tender and other Particulars may be obtained on Application to the undersigned.

HAROLD E. BLOOR, B.Sc., B.Eng.,
Engineer and Manager.

URBAN DISTRICT COUNCIL OF BARNOLDSWICK.

THE above Council invite Tenders for the Supply of 5500 Tons of Best Screened GAS COAL or NUTS, delivered free on rail Barnoldswick (Midland Railway), between June 1, 1910, and May 31, 1911, in such Quantities Monthly as stated on Form of Tender.

The Council do not bind themselves to accept the lowest or any Tender.

Form of Tender supplied on Application to the undersigned.

Tenders must be on the prescribed Forms, and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, *via* Colne, and delivered not later than Monday, May 30, 1910.

J. W. THOMPSON,
Engineer and Manager.

Town Hall, Barnoldswick.

SEVENOAKS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Sevenoaks Gas Company invite TENDERS for 8000 Tons of GAS COAL (Durham or Yorkshire preferred), to be delivered at the Company's Siding (South-Eastern and Chatham Railway), Bat and Ball Station, Sevenoaks, for Twelve Months from June, 1910, to June, 1911.

Tenders must be sent in by not later than Thursday, the 26th day of May, 1910, addressed to the Chairman, W. Henry Cronk, Esq., 88, High Street, Sevenoaks, Kent.

Further Particulars may be obtained of the undersigned.

HENRY HOW,
Secretary.

Gas Offices, Sevenoaks,
Kent, May 12, 1910.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Committees of the Town Council are prepared to receive TENDERS for the Supply of about 2000 Tons of Best Screened GAS COAL, and about 200 Tons of Best Hand-Picked Hard STEAM COAL respectively, for the Twelve Months ending the 30th of June, 1911.

Full Particulars can be obtained on Application to Mr. A. H. Forbes, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Gas Coal," or "Tender for Steam Coal," as the case may be, to be addressed and sent to me, the undersigned, not later than Five o'clock in the Afternoon on Monday, the 30th day of May inst.

The lowest or any Tender will not necessarily be accepted.

W. ADAMS,
Town Clerk.

Saffron Walden,
May 13, 1910.

GAS DEBENTURES FOR SALE.

FIVE Per Cent. First Mortgage Debentures, well secured, in Provincial Gas Company.

Address No. 5243, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."
(GREEN CLOTH, GILT LETTERED.)
Price 2s. each.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
DORKING GAS COMPANY.

NEW ISSUE OF £4000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £2200 "D" CAPITAL GAS STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

MIRFIELD GAS COAL.
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

'BUFFALO' INJECTOR

SEND FOR LIST.

Telegrams: "Temperature London." Tel. No. 12,455 Central.

GREEN & BOULDING, — LIMITED, —
28, New Bridge St., LONDON, E.C.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

LUX'S
Gas Purifying Material
is now used in many Gas-Works throughout Scotland with gratifying success.

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Ludwigshafen-am-Rhein

Sole Agent for Scotland:
DANIEL MACFIE
1, North Saint Andrew Street, EDINBURGH
Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

ADDITIONAL REVENUE FOR GAS-WORKS.
COKE SELLING . . AT 11/6 A TON
COALEXLD SELLING AT 20/- A TON
X IN THE SAME TOWN.
COALEXLD, LIMITED. LANCASTER.

WATER SUPPLIES.
ARTESIAN BORED TUBE WELLS,
Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.
LE GRAND & SUTCLIFF,
Artesian Well and Waterworks Engineers,
MAGDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.

IN PAINTING
THE GASHOLDERS AND OTHER OUTSIDE PLANT IT IS FALSE ECONOMY TO USE A CHEAP PAINT WHICH LOSES COLOUR AND DOES NOT PROTECT THE IRON FROM CHEMICAL FUMES.
"SHELL BRAND" (Pure) PAINTS
POSSESS ALL THE PROPERTIES WHICH CHEAP PAINTS LACK.
Prices and particulars on application.
A. H. HAMILTON & CO.,
Possilpark, Glasgow.
"SHELL BRAND" TRADE MARK REGISTERED

SPECIAL ROTARY METER.
For Coke Oven Gas.
For Blast Furnace Gas.
For FOUL GAS.
Particulars on application to—
T. G. MARSH,
28, Deansgate, MANCHESTER.

GAS COAL AND CANNEL.
WILSON CARTER & PEARSON,
LIMITED.
Gas, Steam, and other Fuel for Home and Export.
GAS COKE CONTRACTORS.
Chief Offices: **50, NEW STREET, BIRMINGHAM.**
Telegraphic Address: "CARTER PEARSON, BIRMINGHAM." Telephone Nos.: CENTRAL 3013 and 3014.

S. S. STOTT & CO.,
ENGINEERS,
HASLINGDEN, nr. MANCHESTER.
LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

THE WIGAN COAL & IRON CO., LIMTD.,
Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone: No. 200.
LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.* Telegraphic Address: "PARKER, LONDON."

GRAETZIN LIGHT

Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

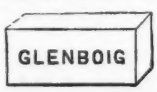
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

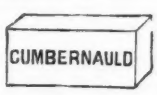
THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.





The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.
Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIRS,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·92	1·06
Loss on Ignition	13·20	—
	100·00	100·00

PHYSICAL RESULTS.

Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70%
" " 1050° C.	4·76%
" " Total	8·46%
Volume shrinkage at 100° C.	10·7 %
" " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. to 3362° F. (SEGER CONE 36.) (New Scale CONE 38.)

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.

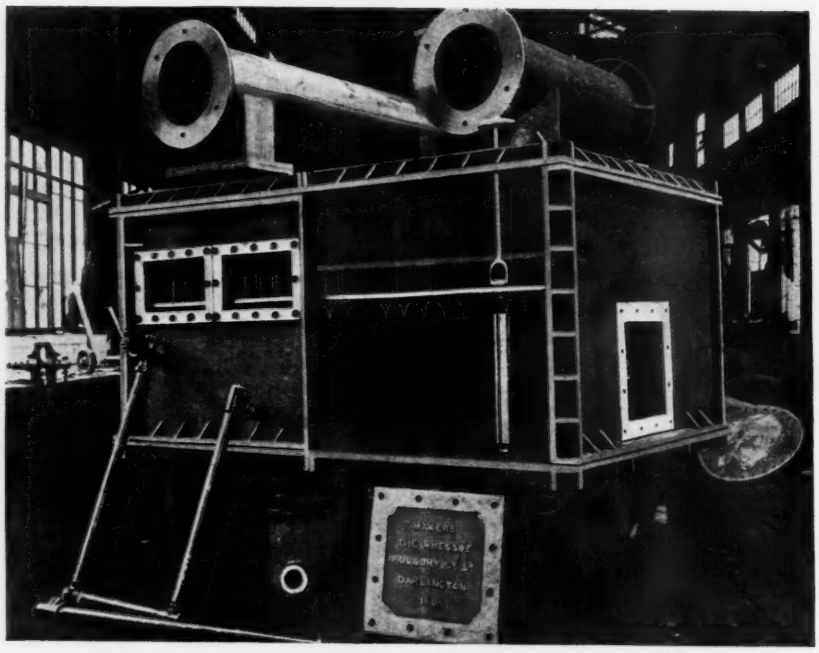
THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

Gasholders.

Condensers.

Purifiers.



Washer-Scrubbers.

Steel Tanks.

Cast-Iron Tanks.

Livesey Washer, in course of construction in our Works.

London Office: 106, CANNON STREET, E.C.

S. CUTLER & SONS, MILLWALL, LONDON.

And at 39, Victoria St., Westminster, S.W.

GASHOLDERS & STEEL TANKS

Carburetted Water Gas Plant.

DESSAU VERTICAL RETORTS.

Messrs. S. CUTLER & SONS are Contractors to the Vertical Gas Retort Syndicate, Ltd., for all Constructional Steel Work, Operating Gears, Fittings, &c., &c.

The DESSAU System has been adopted at over 60 Gas-Works and up to the present date 5238 Retorts have been ordered.

WATER TUBE CONDENSERS. PURIFIERS.

OIL TANKS. ROOFS. GIRDERS.

Every Requirement for Gas-Works Supplied.

No. 252

GRAHAM, MORTON & CO.,

— LEEDS. —

RETORT BUILDERS ON THE

INCLINED, HORIZONTAL, OR VERTICAL

SYSTEM.

Contractors to the Vertical Gas Retort Syndicate, Ltd., for all BRICKWORK in the

DESSAU VERTICAL RETORT INSTALLATIONS.

See Certified Results of the first Installation on this System in England erected at The Ayres Quay Gas-Works, Sunderland.

Makers and Erectors of

COAL & COKE CONVEYING PLANTS

COMPLETE WITH

Elevators, Conveyors, Breakers, Bunkers, &c.

STEEL STRUCTURAL WORK. ROOFS, &c.

Telegrams: "ACCOUPLE, LEEDS." Telephone: No. 1982 LEEDS.

THOMAS PIGGOTT & CO., LD.,

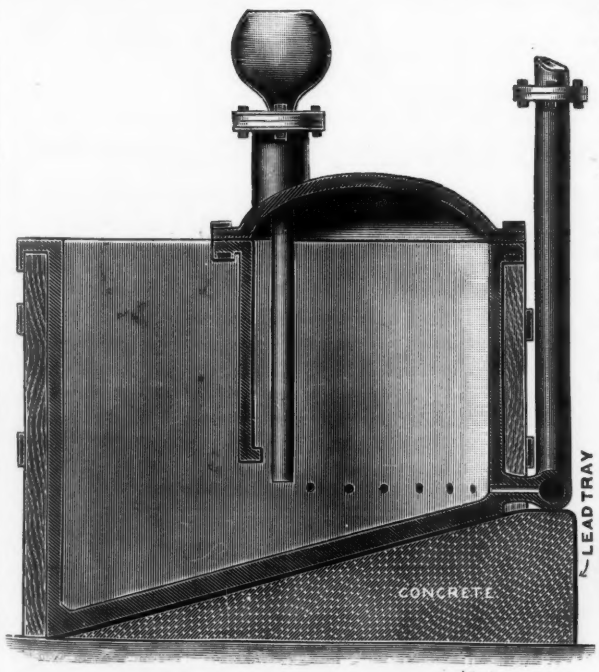
BIRMINGHAM.

LAPWELDED AND RIVETED STEEL PIPES.

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANTS.

Aggregate Capacity of Plants supplied 231,600,000 cubic feet Daily.

SULPHATE OF AMMONIA PLANT



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

ADVANTAGES:—

1. **Equal distribution of Steam and Ammonia.**
2. **Perfect agitation and boiling of the Acid Liquor.**
3. **No possibility of local Alkalinity.**
4. **Consequently no formation of Blue Salt.**
5. **Sulphate is easily forced to point of discharge.**
6. **No incrustation.**
7. **No renewals of Cracker Pipe.**
8. **Capacity of output greatly increased.**

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

BIGGS, WALL & CO.

13, Cross Street, Finsbury Pavement,

LONDON, E.C.

Telegrams: "RAGOUT LONDON." Telephone: 273 CENTRAL.

The Outcome of a Practical Gas Engineer's Life Experience.

THE CENTENARY PETROL GAS TURBINE GENERATOR.

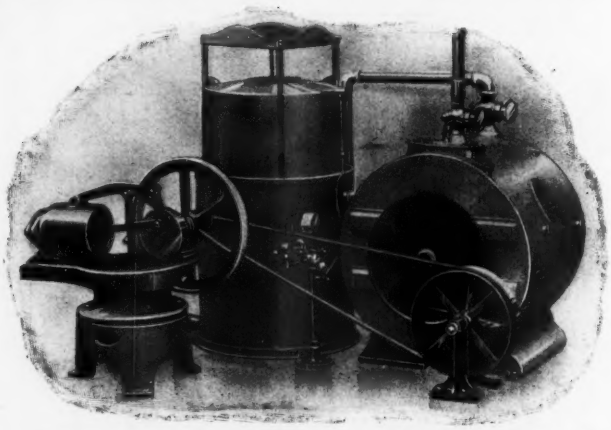
FOR

Lighting, Cooking, Heating

FOR

Villages,
Mansions,
Farm Steadings,
Churches, Schools,
Railway Stations,
County Lighting Districts.

Plants from 100 cub. ft. per hour up to 50,000 cub. ft. per hour for Gas Works.



THE CENTENARY GAS CO. (Dept. M.)

WILLIAM KEY, Engineer.

109, HOPE STREET, GLASGOW. 11, QUEEN VICTORIA STREET, LONDON.

NON-EXPLOSIVE and ECONOMICAL.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

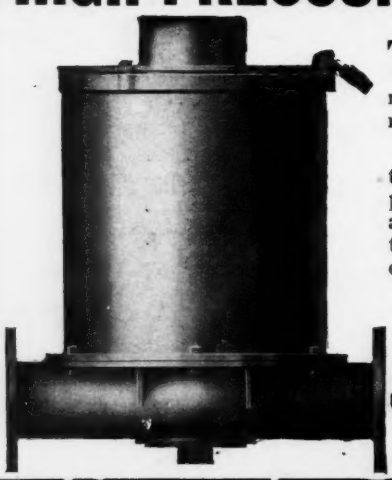
1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gas-ways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

PRICES AND PARTICULARS ON APPLICATION.

OFFICES AND WORKS AT
Hyson Green, Nottingham.
Telegraphic Address: "Gasometer Nottingham." Telephone: 204X Nottingham.

LONDON DEPOT:
Malt Street, Old Kent Road, S.E.
Telegraphic Address: "Gasometer London." Telephone: 2044 Hop.

HIGH PRESSURE MERCURIAL GOVERNOR



THIS Governor has been specially designed to work on high pressure mains, where these have been adopted, to effect the necessary reduction from the high pressure in the main to the low pressure required for normal working.

It can be supplied to suit any desired range of pressures; for example, the standard size reduces from 5 lbs. inlet pressure to ordinary low pressure. At the same time the Governor is correctly compensated and so accurately adjusted that, in the event of the main being temporarily used for low pressure distribution, it will work as an ordinary low pressure governor.

SIZES AND PRICES ON APPLICATION.

JAMES MILNE & SON, LIMITED,

EDINBURGH. LONDON. GLASGOW. LEEDS.

Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

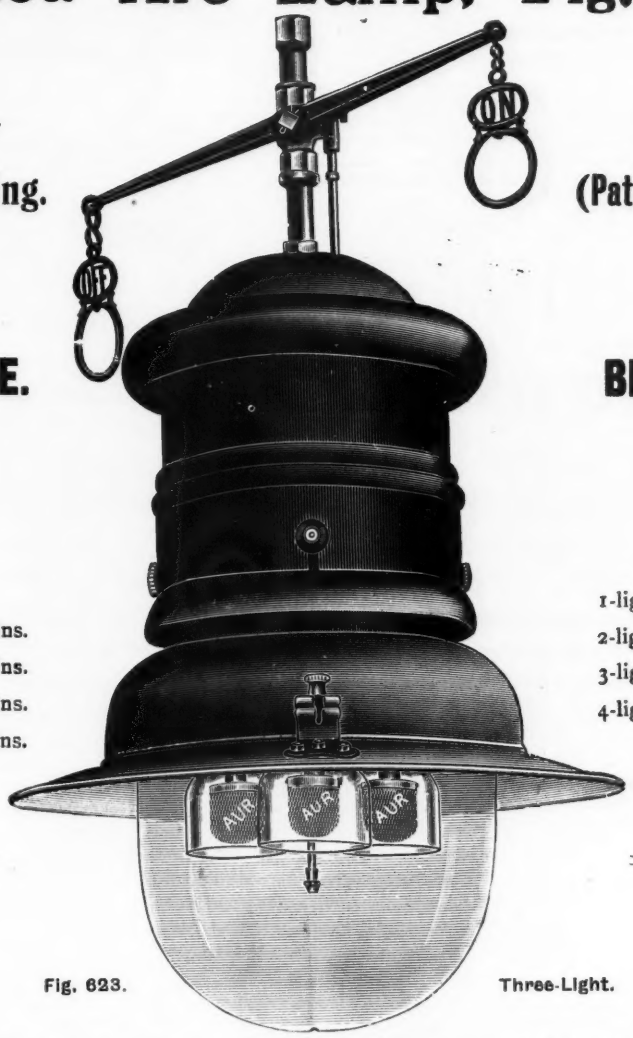


Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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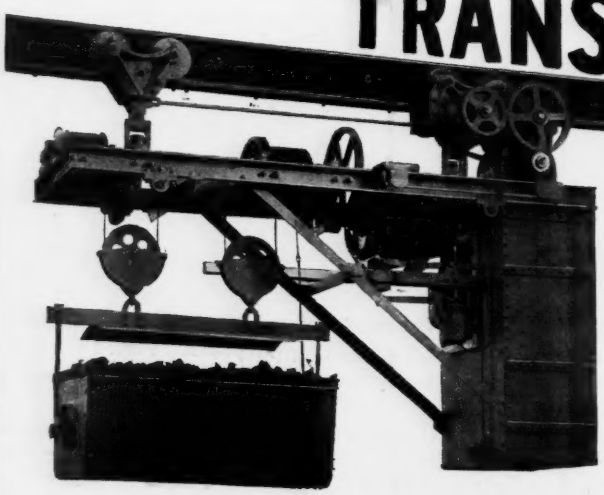

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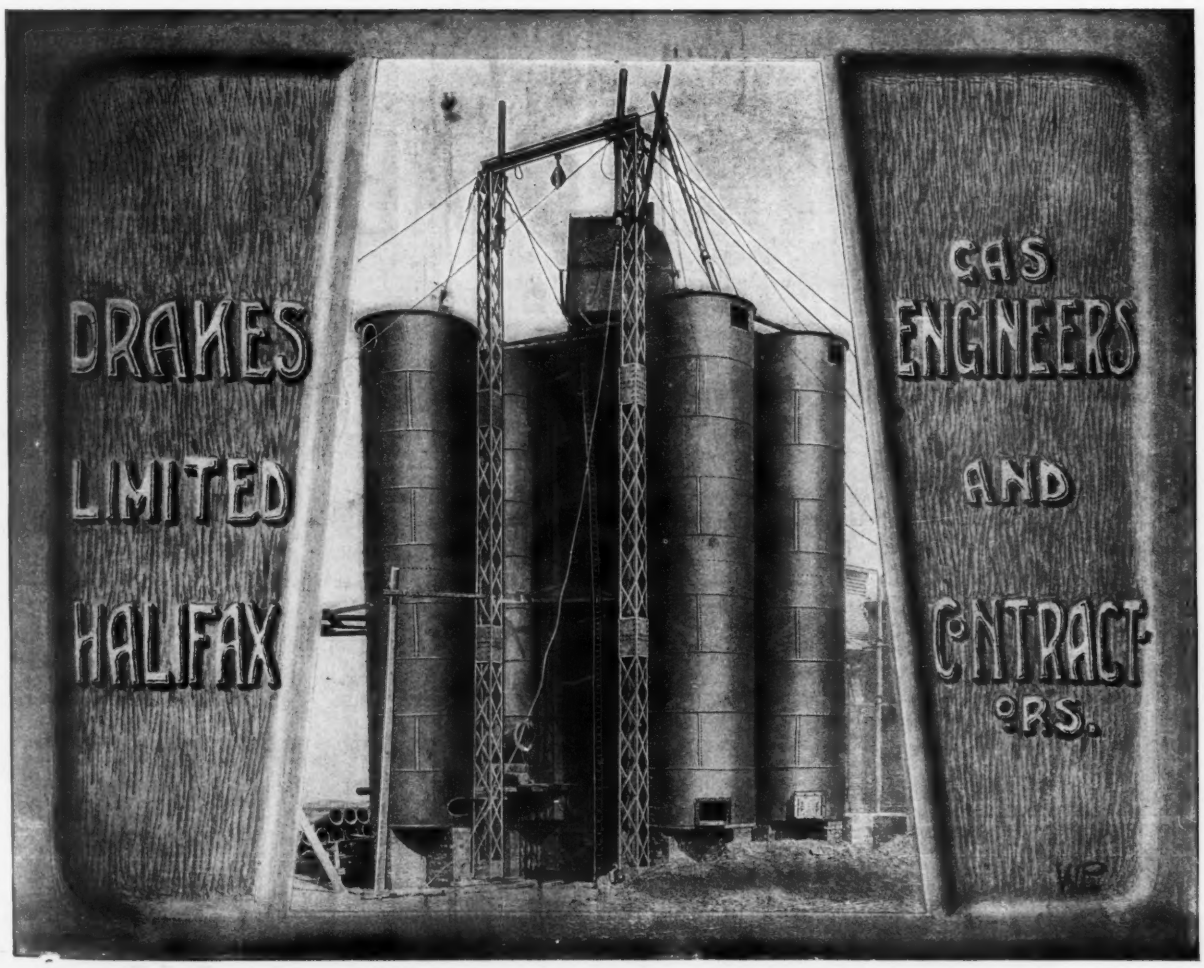

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